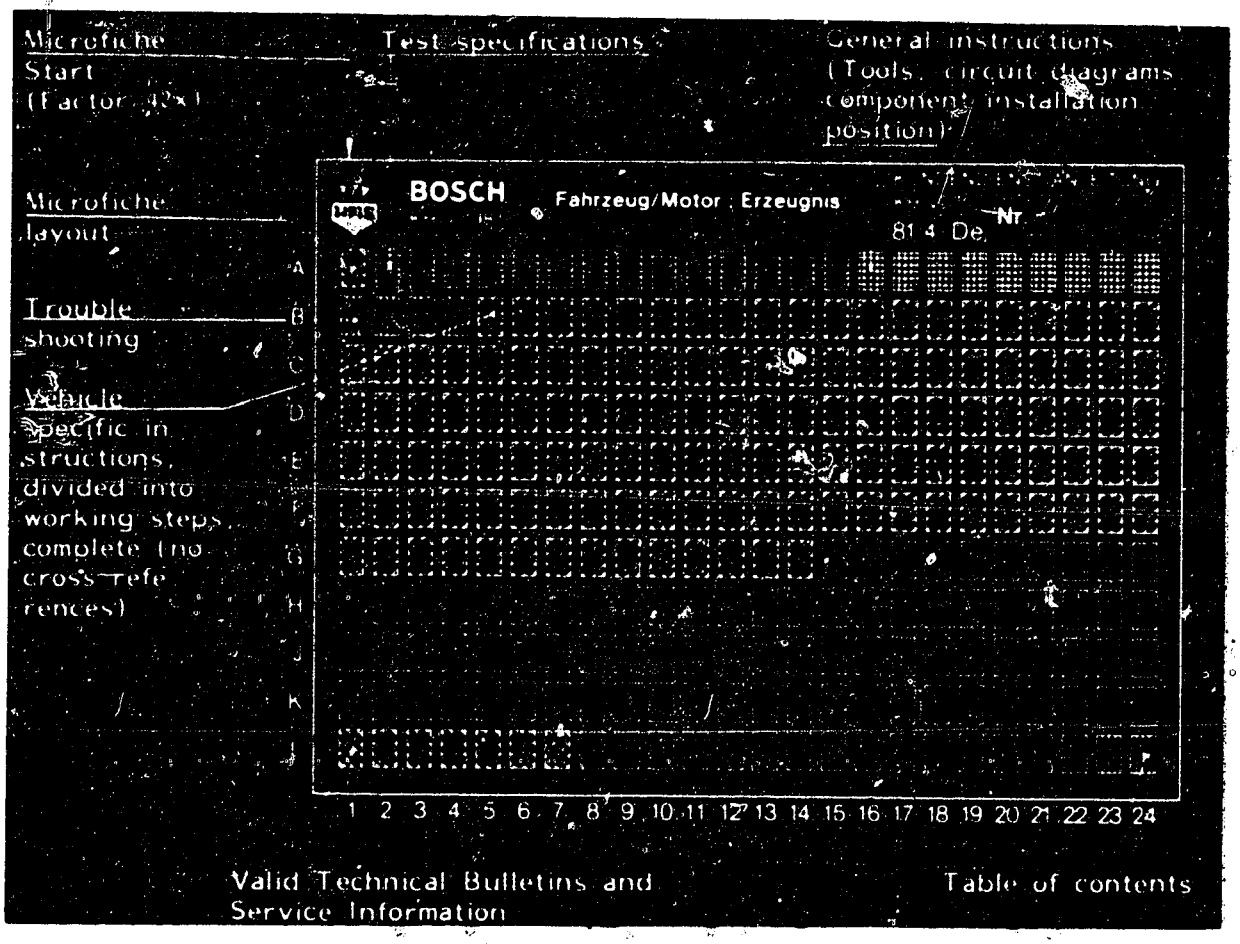
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section
➡	⬅➡	⬅	➡⬅

4. Purely vehicle-specific passages in the text are marked with a vertical bar. |

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

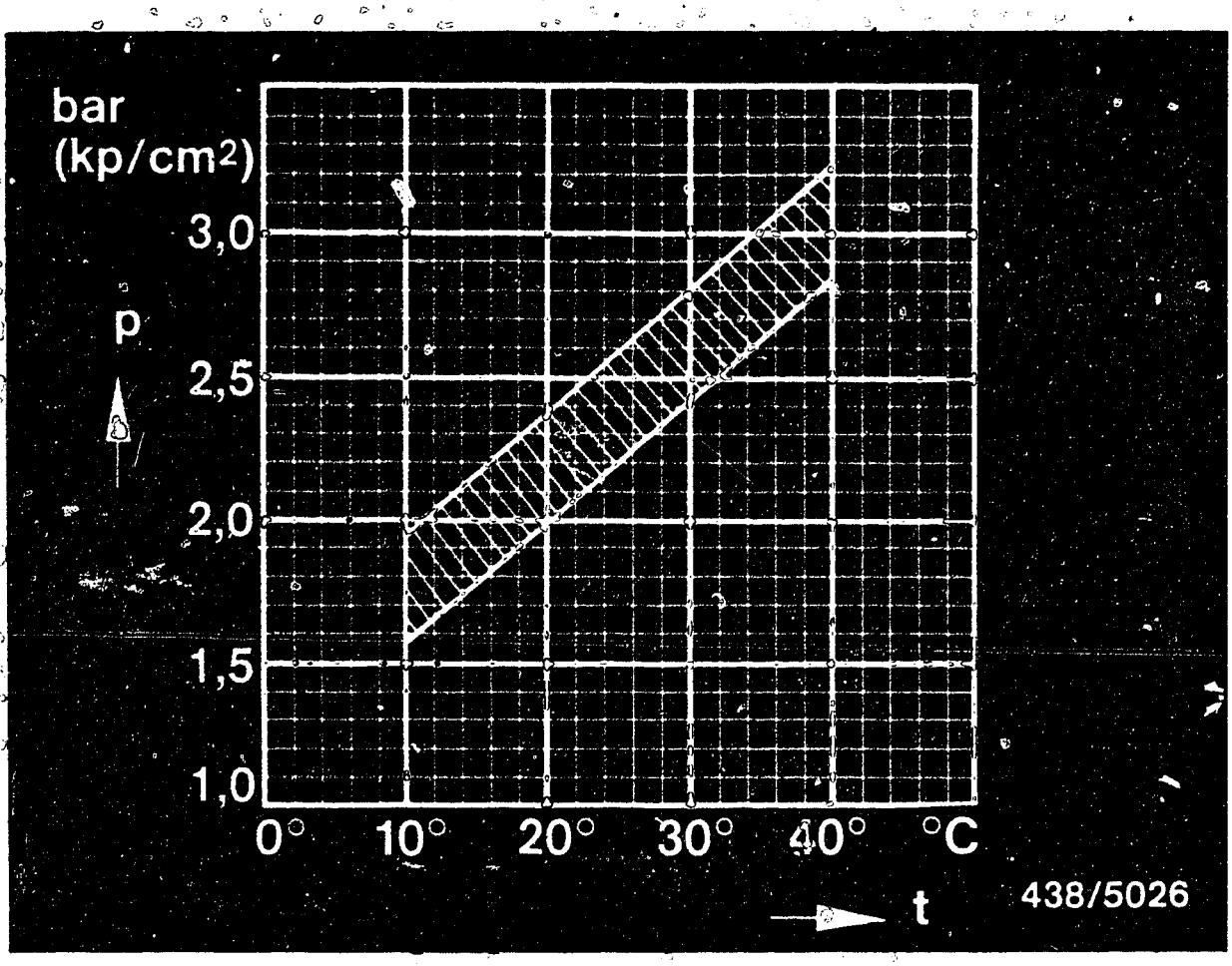
A1	Trouble-Shooting Plan	⬇

1. Test specifications

1.1 Electric fuel pump

B22

Test step	Test specifications
Fuel delivery:	min. 1000 cm^3/30 s



p = Control pressure
t = Ambient temperature

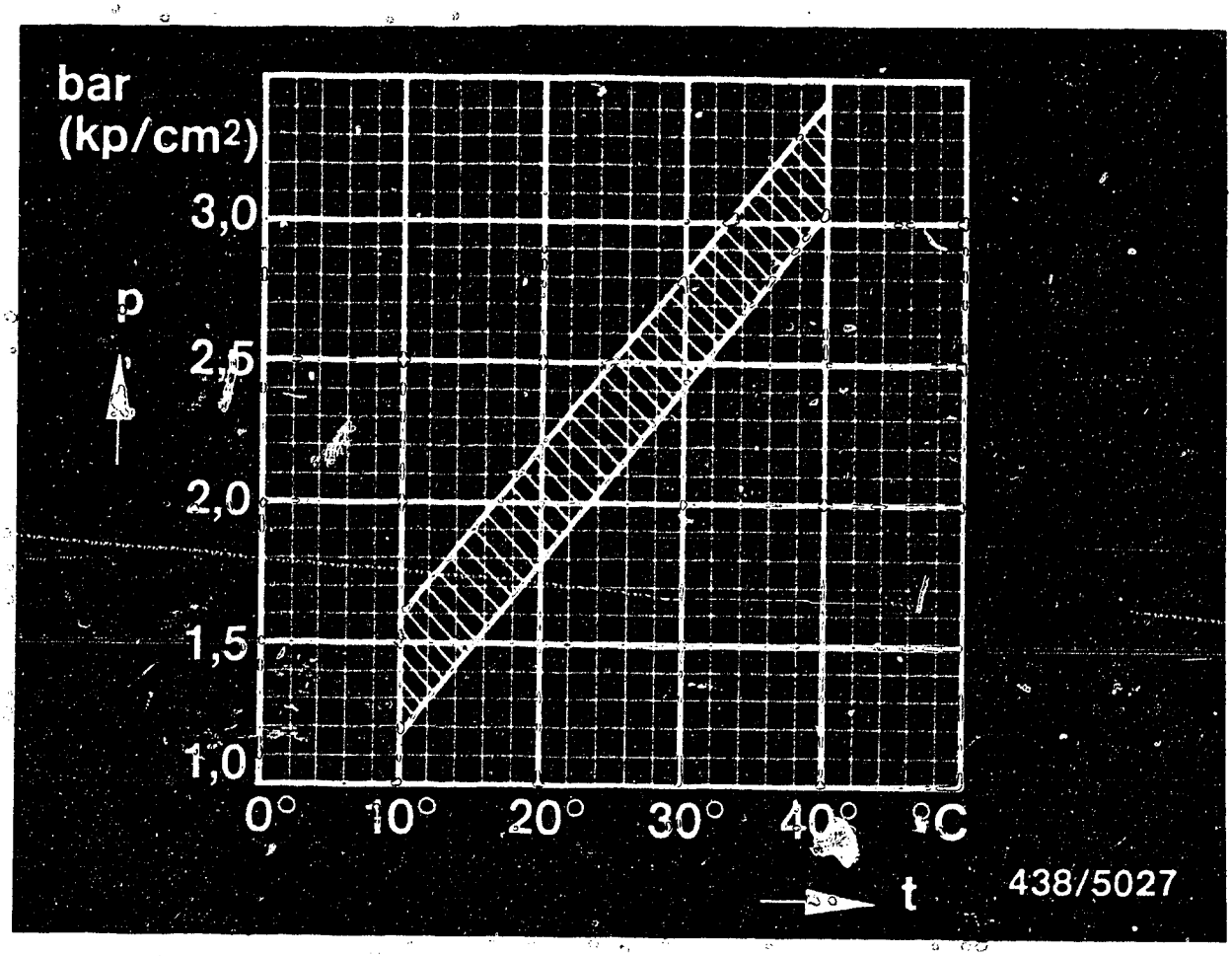
C11

1.2 Control pressure "cold"

(Part No. of warm-up regulator: 0 438 140 045)

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 465...600 mbar
(350...450 Torr)



p = Control pressure
t = Ambient temperature

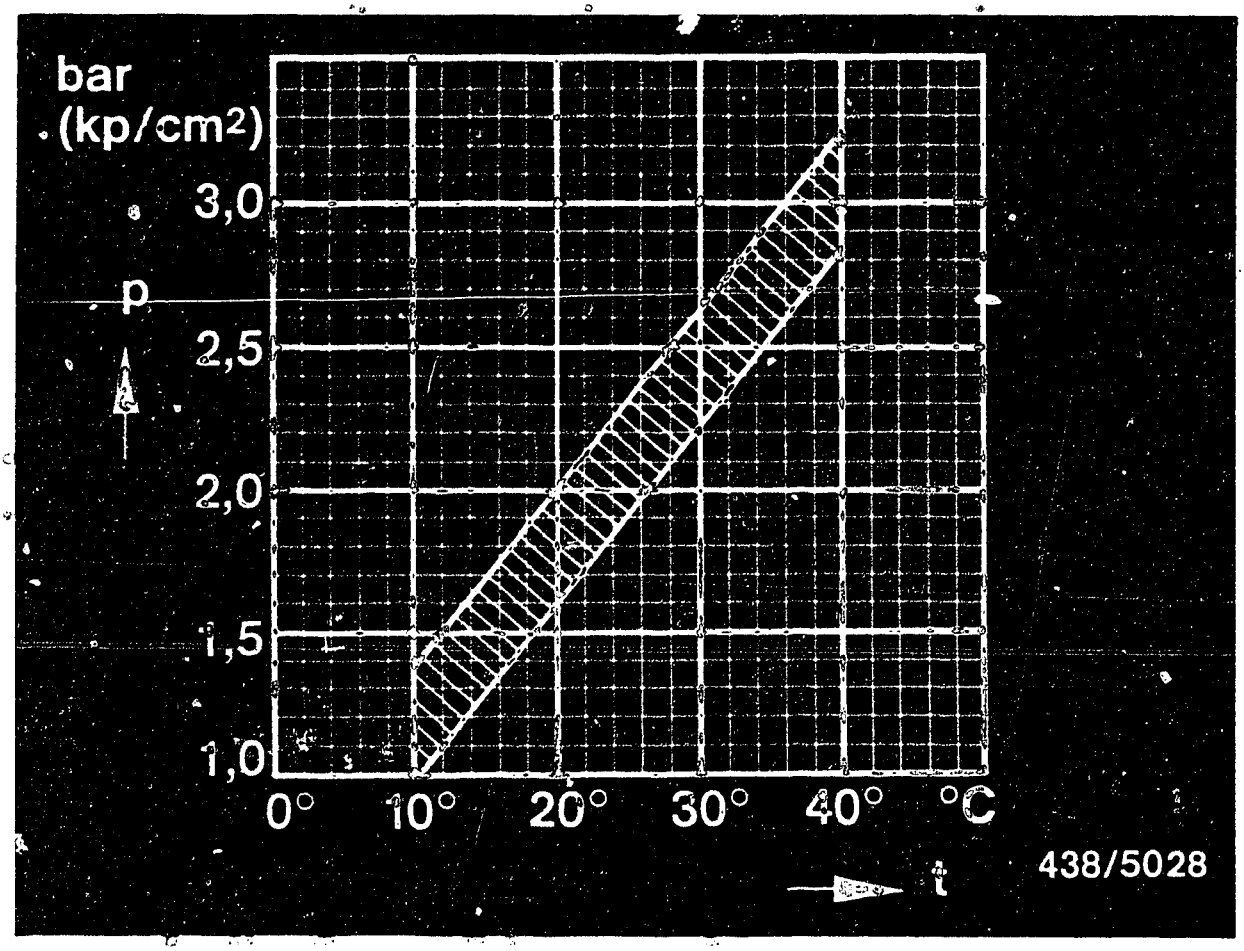
C11

Control pressure "cold"

(Part No. of warm-up regulator: 0 438 140 069)

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 465...600 mbar
(350...450 mmHg)



p = Control pressure
t = Ambient temperature

1.2 Control pressure "cold"

C11

(Part No. of warm-up regulator: 0 438 140 089)

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 465...600 mbar
(350...450 mmHg)

Test step	Test specifications*

C11

1.3 "Warm" control pressure

Part No. of warm-up regulator: 0 438 140 045
... 069

- Test with atmospheric pressure (without vacuum) — 2.7...3.1 bar (2.8...3.2 kgf/cm²)
- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

  Setting value: 465...600 mbar (350...450 mmHg) — 3.2...3.6 bar (3.3...3.7 kgf/cm²)

"Warm" control pressure

Part No. of warm-up regulator: 0 438 140 089

- Test with atmospheric pressure (without vacuum) — 2.7...3.1 bar (2.8...3.2 kgf/cm²)
- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator

  Setting value: 465...600 mbar (350...350 mmHg) — 3.4...3.8 bar (3.5...3.9 kgf/cm²)

*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm² (gauge pressure).

Test step	Test specifications*

1.4 Primary pressure — D12

Test specification:	4.5...5.2 bar (4.6...5.3 kgf/cm²)
Setting value:	4.7...4.9 bar (4.8...5.0 kgf/cm²)

1.5 Leak test — D19

Minimum pressure after 10 minutes: 1.6 bar (1.7 kgf/cm²)
after 20 minutes: 1.4 bar (1.5 kgf/cm²)

1.6 Injection valves — E14

Opening pressure:	2.5...3.6 bar (2.6...3.7 kgf/cm²)

1.7 Fuel distributor — F4

0 438 100 031
0 438 100 097

Delivered-quantity comparison at the outlets:	Setting point cm³/min	Max. allowable delivery cm³/min
Idle	6.0	6.8
Part load	40.0	44.0
Full load	140.0	153.0

* Pressures in the test specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

1.8 Idle adjustment

F20

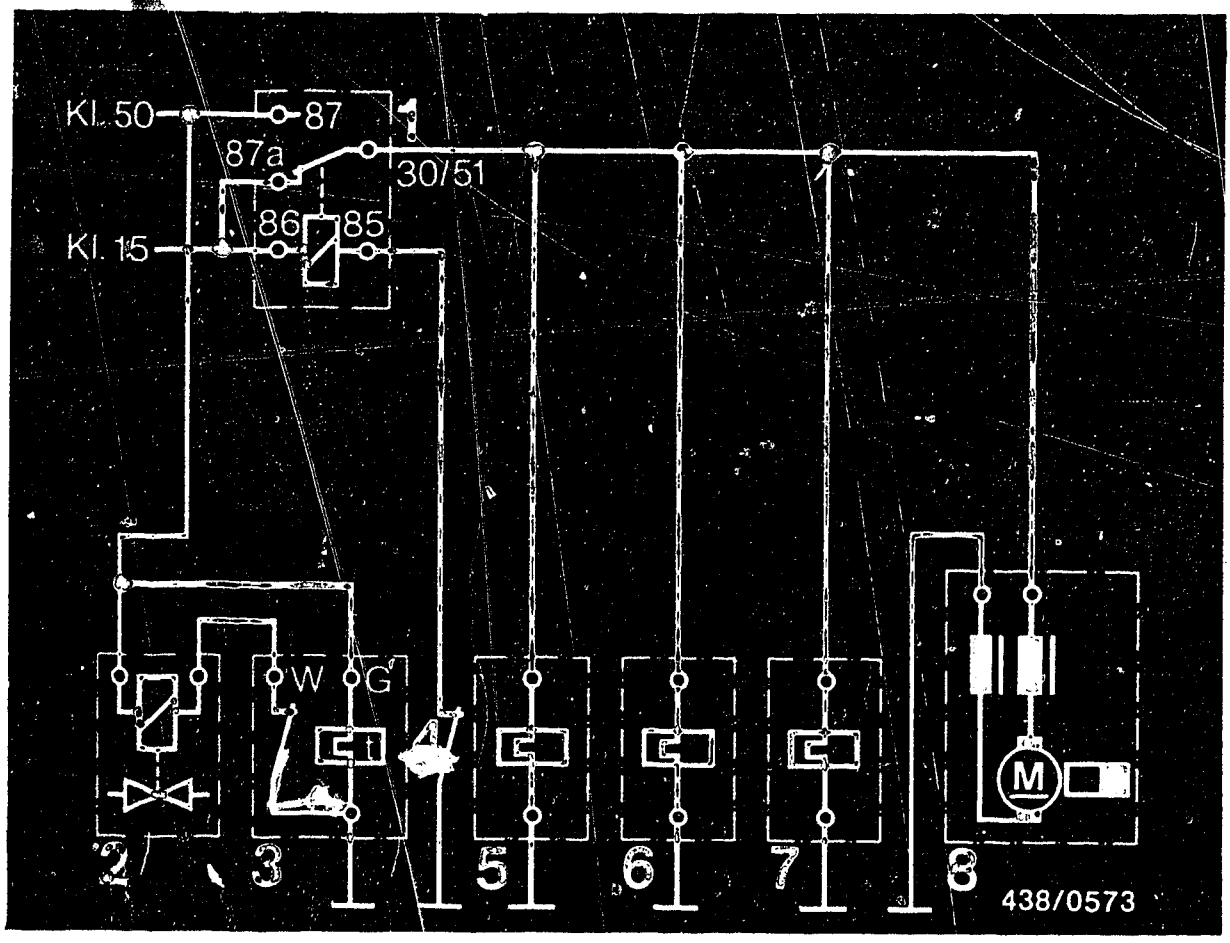
Note: Engine oil temperature approx. 80°C

Idle speed:

Model 1978/1979 worldwide version	850...950 min^{-1}	
Model 1978/1979 USA/Canada/Japan	900...1000 min^{-1}	
Model 1980/1981 worldwide version excluding USA/Canada/Japan (without lambda closed-loop control)	850...950 min^{-1}	

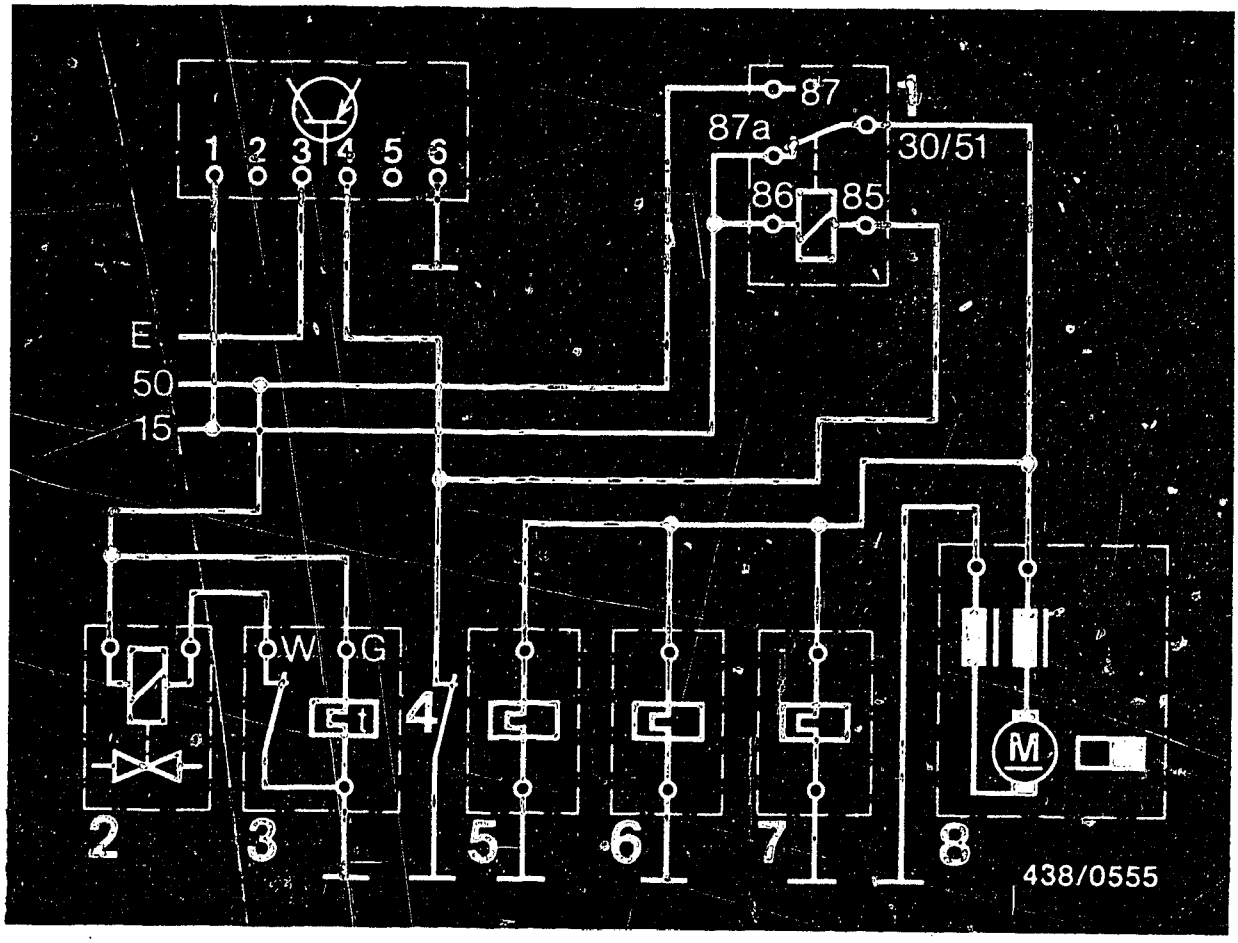
CO concentration:

Model 1978/1979 worldwide version	2.0...4.0%	without auxiliary-air injection
Model 1978/1979 USA/Canada/Japan (measured upstream of catalyst)	1.5...3.5%	without auxiliary-air injection
Model 1980/1981 worldwide version excluding USA/Canada/Japan (without lambda closed-loop control)	1.0...2.0%	without auxiliary-air injection



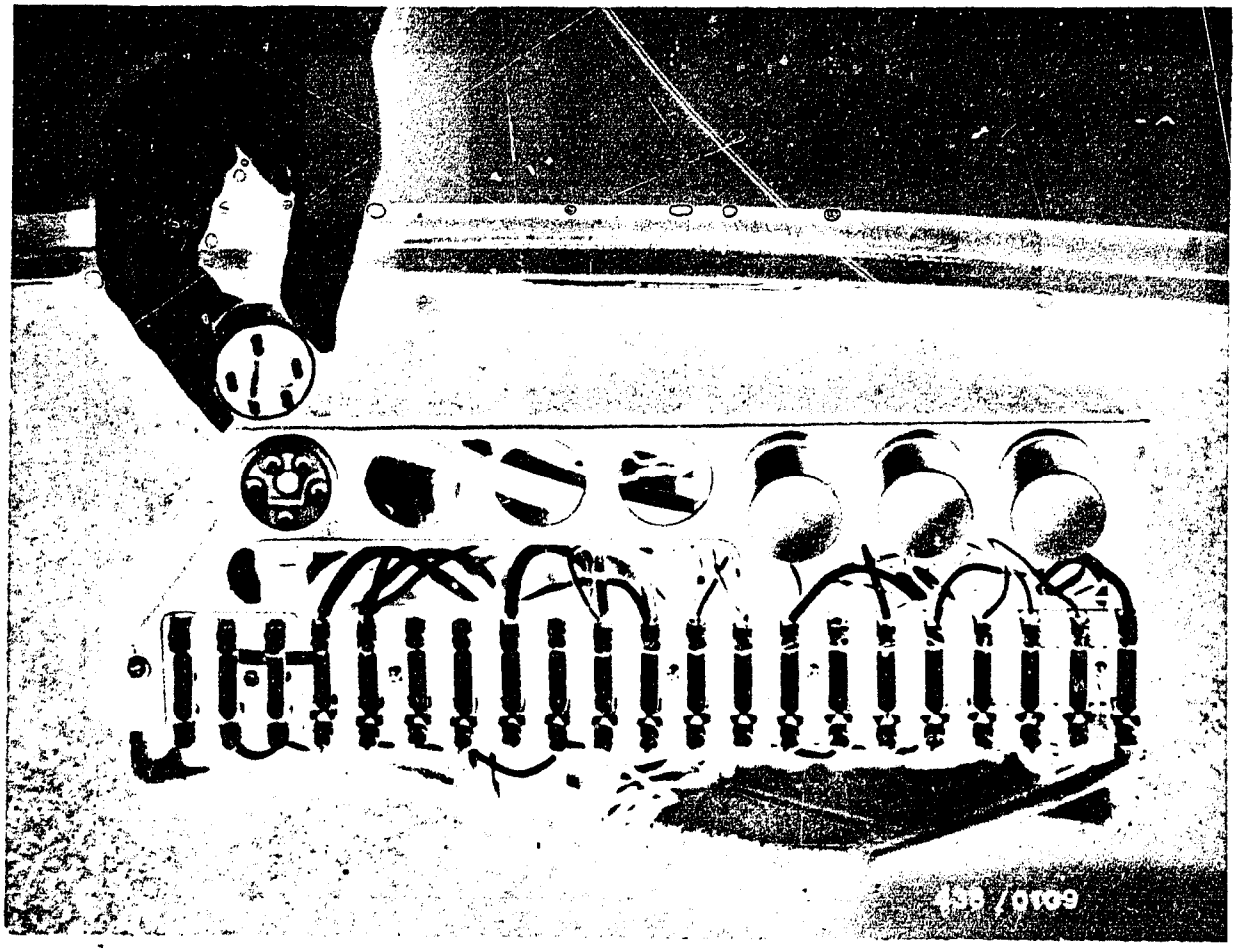
2. Electrical safety circuit

1 = Electronic relay
2 = Start valve
3 = Thermo-time switch
4 = Air-flow sensor contact
5 = Warm-up regulator
6 = Auxiliary-air device
7 = Thermostat valve
8 = Electric fuel pump



Engine-speed limitation (protection against overrevving): All models are equipped with automatic engine-speed limitation.
In the USA/Canada/Japan models 1978/1979 (with exhaust-gas catalyst) the electric fuel pump is switched off by an electronic rotational-speed relay at n = 6500 ± 200 min^{-1} (see circuit diagram). The switching off of the fuel supply prevents the concentration of unburned fuel in the catalyst - and thus prevents an impairment of the operation of the catalyst.

In the other models the engine speed is limited by a mechanical ignition cutoff in the rotor arm of the ignition distributor.
Cut-out speed: 6500 ± 200 min^{-1}.

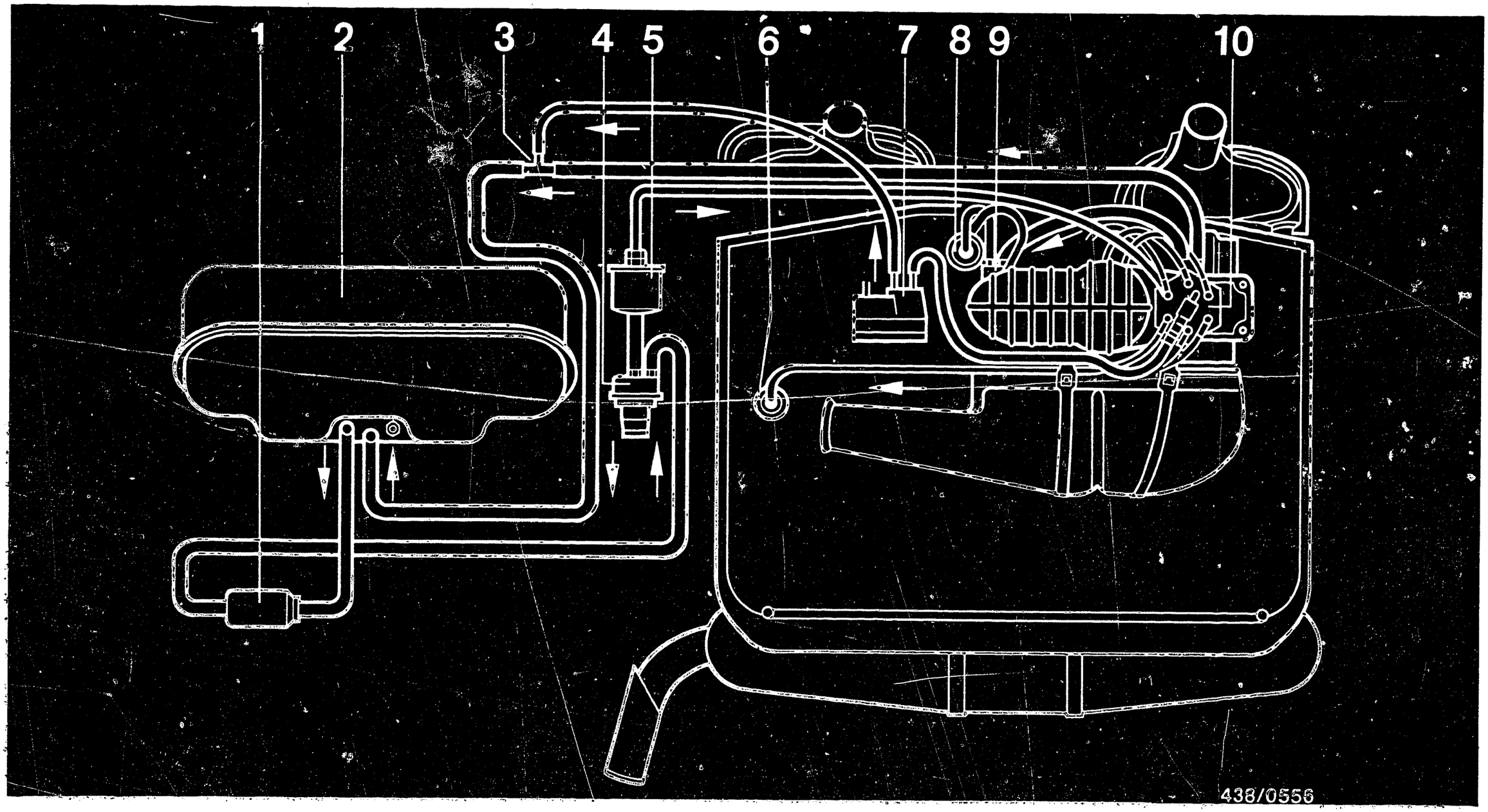


2.1 Bridging the electrical safety circuit for testing:

The electrical safety circuit can be bridged by removing the plug from the air-flow sensor.

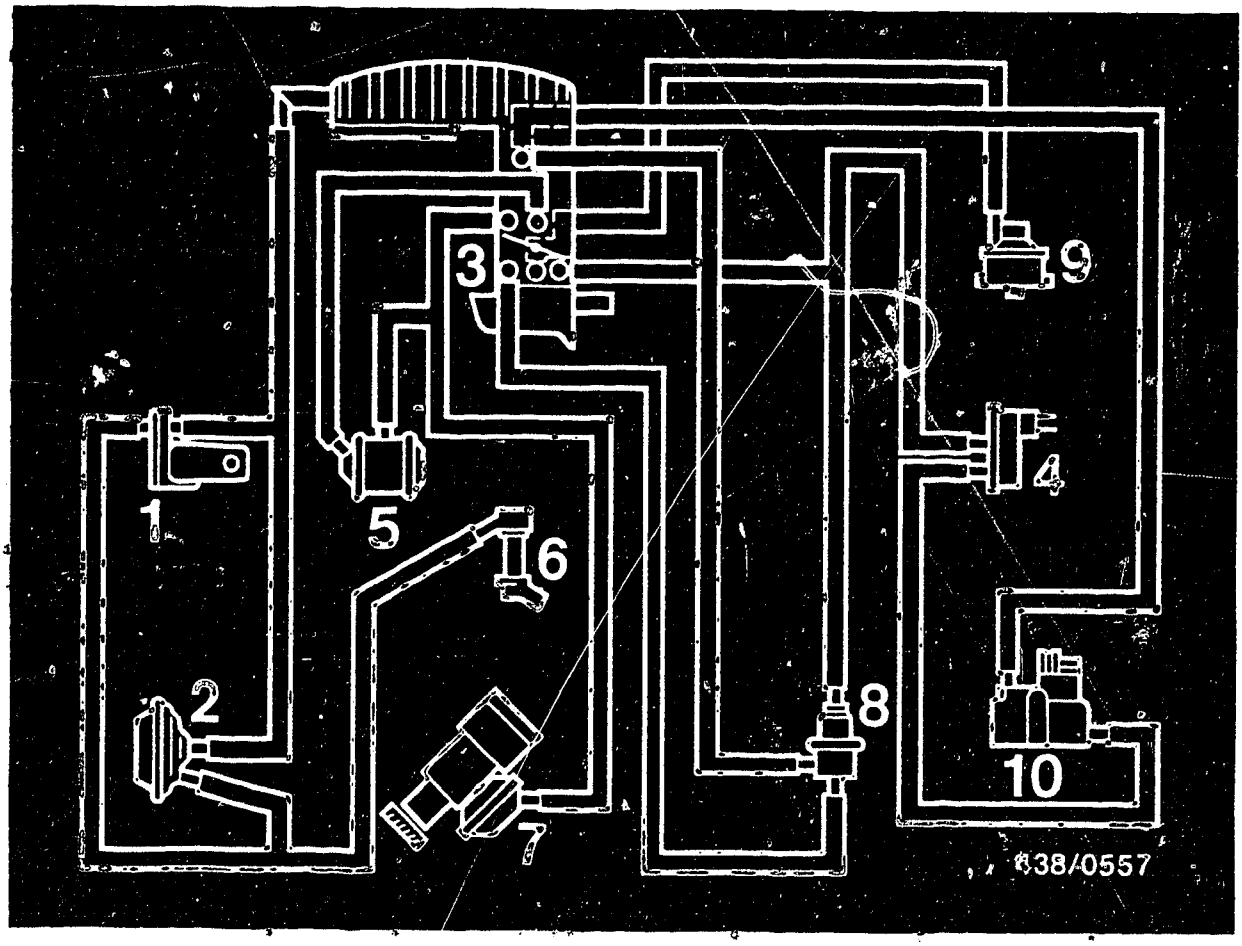
Since this plug is not readily accessible, it is also possible to bridge terminals 30 and 87a of the relay.

The relay is located on the central-electrics console in the luggage compartment (on the left-hand side as viewed from behind the vehicle), rear relay.



3. Diagram of fuel lines

1 = Electric fuel pump
2 = Fuel tank
3 = Connecting piece for fuel return lines
4 = Fuel accumulator
5 = Fuel filter
6 = Injection valve
7 = Warm-up regulator
8 = Vacuum limiter
9 = Start valve
10 = Mixture-control unit



3.1 Layout of lines in vacuum system

1 = Auxiliary-air device
2 = Auxiliary-air valve
3 = Throttle-valve assembly
4 = Thermo-valve
5 = Exhaust-gas recirculation valve (only USA/Canada/ Japan model 1978/1979)
6 = Vacuum tap for auxiliary-air valve and auxiliary-air device
7 = Ignition distributor (engines with lambda closed-loop control:
Ignition distributor with double vacuum unit
Advance unit = red hose, Retard unit = blue hose)
8 = Vacuum limiter
9 = Blow-off valve (not with lambda closed-loop control)
10= Warm-up regulator (intake-manifold-pressure connection, not with lambda closed-loop control)

Explanation of thermo-valve (Item 4)

When the engine is started cold, the thermo-valve briefly interrupts the vacuum connection to the warm-up regulator. This reduces the control pressure and enriches the mixture to a greater extent.

After starting, the valve opens as a result of electric heating and thus again opens the vacuum line to the warm-up regulator.

The thermo-valve is connected in parallel to the electric fuel pump, warm-up regulator and auxiliary-air device.

Explanation of the vacuum limiter (Item 8):

The vacuum limiter is a vacuum-controlled auxiliary-air device which opens only on the overrun. In all other operating conditions the vacuum limiter must be tightly closed.

4. General information

4.1 Introduction:

This repair manual refers to the Porsche 911 SC model as from 1978, and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

4.2 Design of the K-Jetronic

The entire system of the K-Jetronic corresponds to the basic design as described in Technical Instruction VDT-U 3/1 En.

The air-flow sensor is in the updraft version.
The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment.

As from the 1980 model:
The fuel distributor is provided with adjustable differential-pressure valves. In this type of fuel distributor, screw plugs are situated adjacent to the fittings for the fuel-injection lines.

This possibility for adjustment has only been introduced for production at the works. This does not result in any additional adjustment possibilities for the After-Sales Service Organisation. For this reason, the fuel distributor is to be dealt with in precisely the same manner as the conventional model. The screw plugs must not be removed or loosened.

4.3 Other equipment:

All models are equipped with a secondary-air pump.

The USA/Canada/Japan models 1978/1979 are additionally equipped with exhaust-gas recirculation and an exhaust-gas catalyst.

In addition, the intake system has various auxiliary components which should be borne in mind when trouble-shooting. Coordinate A 14 contains a diagrammatic presentation of the vacuum system with the auxiliary components as well as corresponding information on how they operate.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034). For testing all fuel pressures and testing for leaks.

- Connecting-parts set KDJE-P 100/10 (previously KDEP 1034/10). For connecting pressure tester.

- Adjusting wrench KDEP 1035. For adjusting the idle-mixture-adjusting screw in the mixture-control unit (idle-speed adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm). For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451). For comparing the fuel delivered from the individual fuel-distributor outlets.

- Line set KDJE-P 200/25 (previously KDJE 7451/25). For connecting the tester for delivered quantity comparison KDJE-P 200 in the 1981 model with steel fuel-injection tubing.

- Graduate (commercially available, capacity approx. 1.5 l).
  For measuring the delivery of the electric fuel pump.

- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

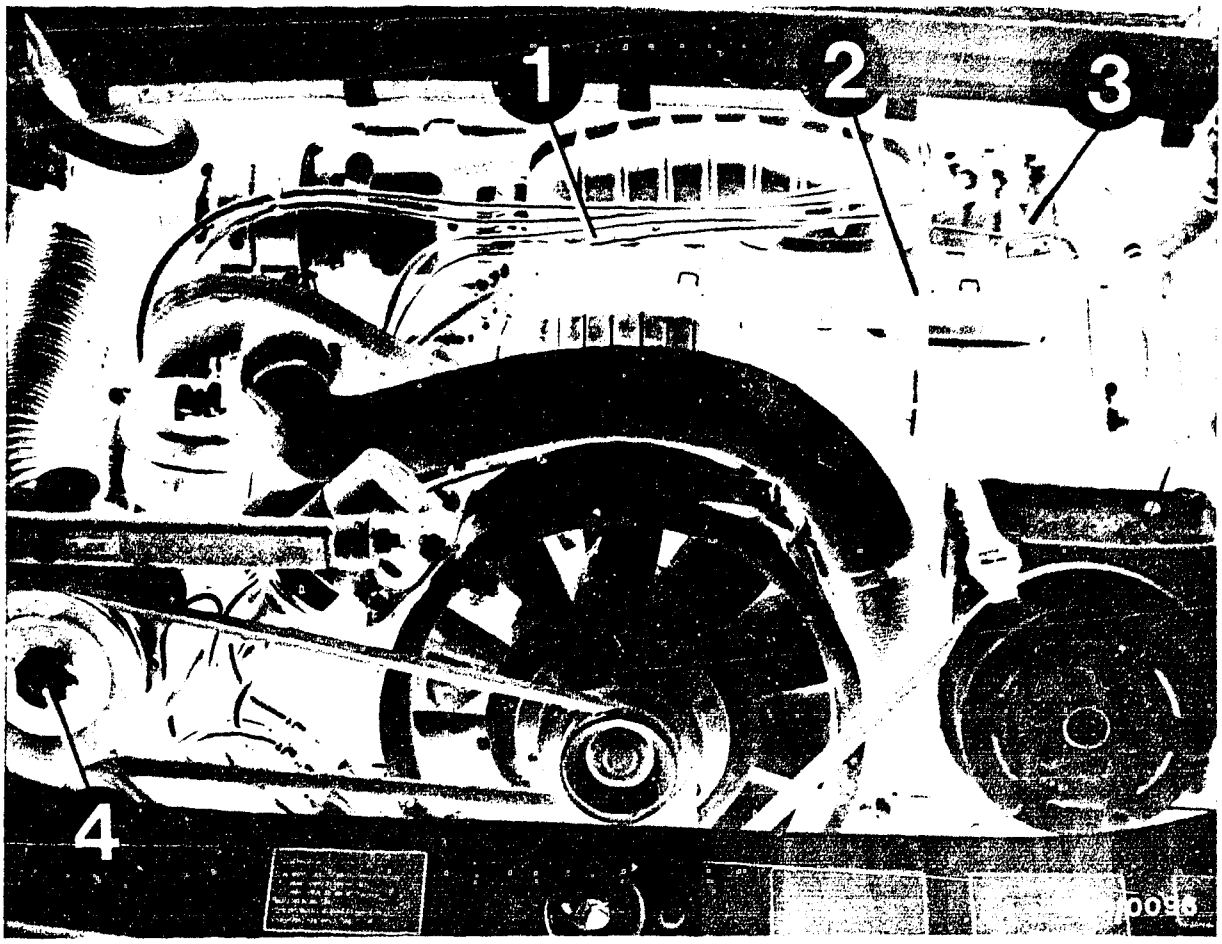
- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
Bosch, Part Designation VS 14 942-CH
(previously Part No. 5 973 340 650)
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available).
  For idle-speed adjustment.

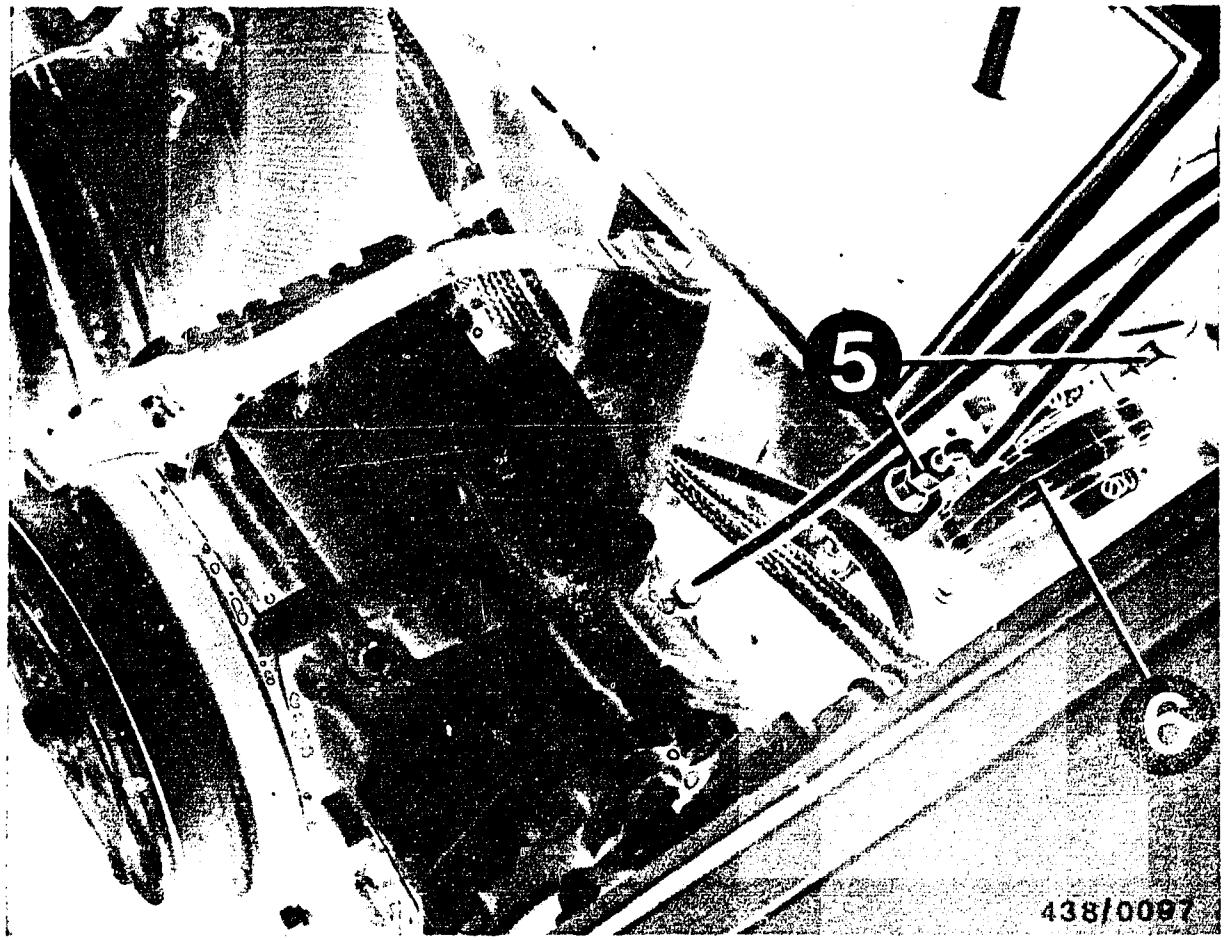
- CO meter (commercially available).
  For idle-speed CO adjustment.



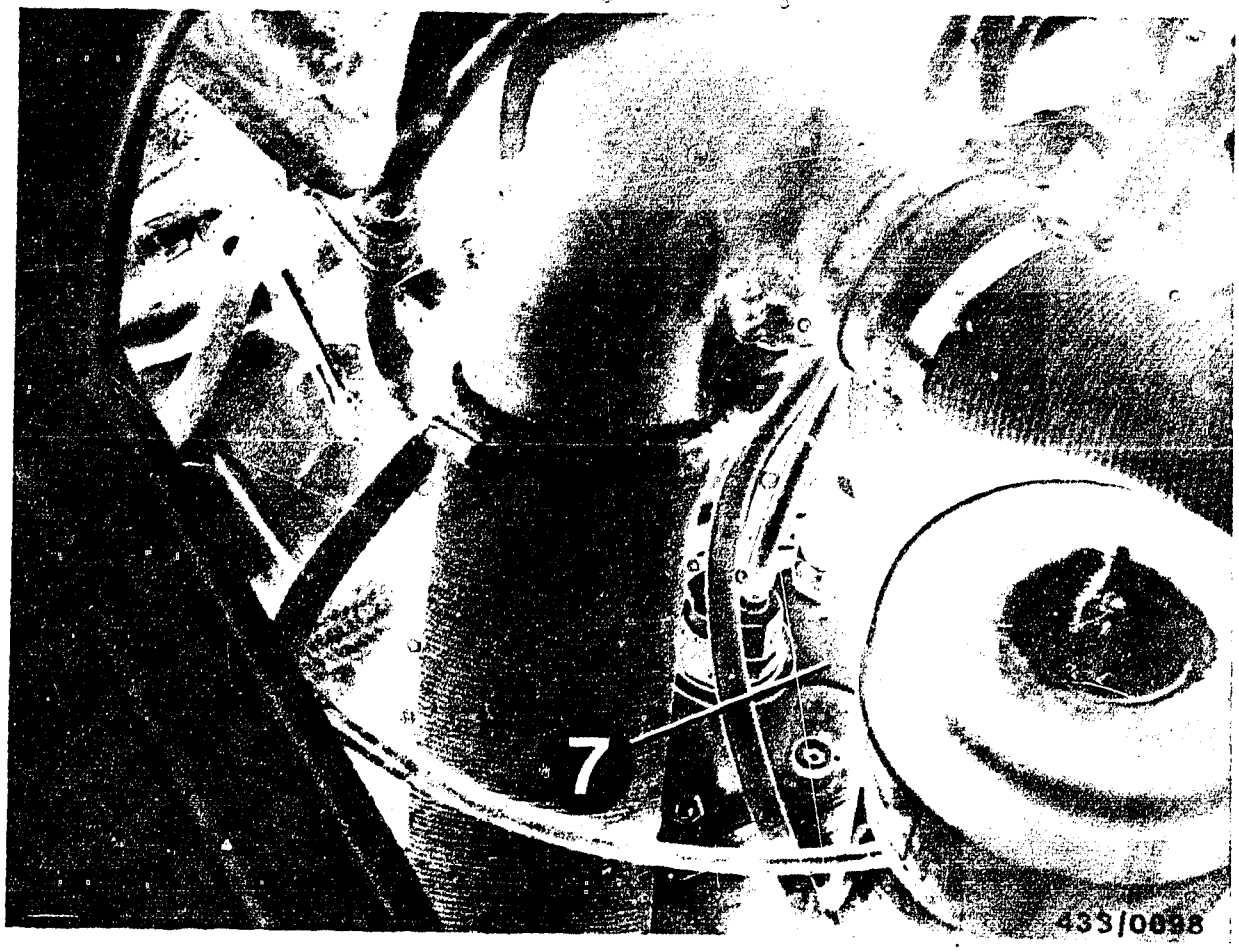
1 = Throttle-valve assembly
2 = Intake housing
3 = Mixture-control unit (air filter removed)
4 = Secondary-air pump

6. Installation position of individual components

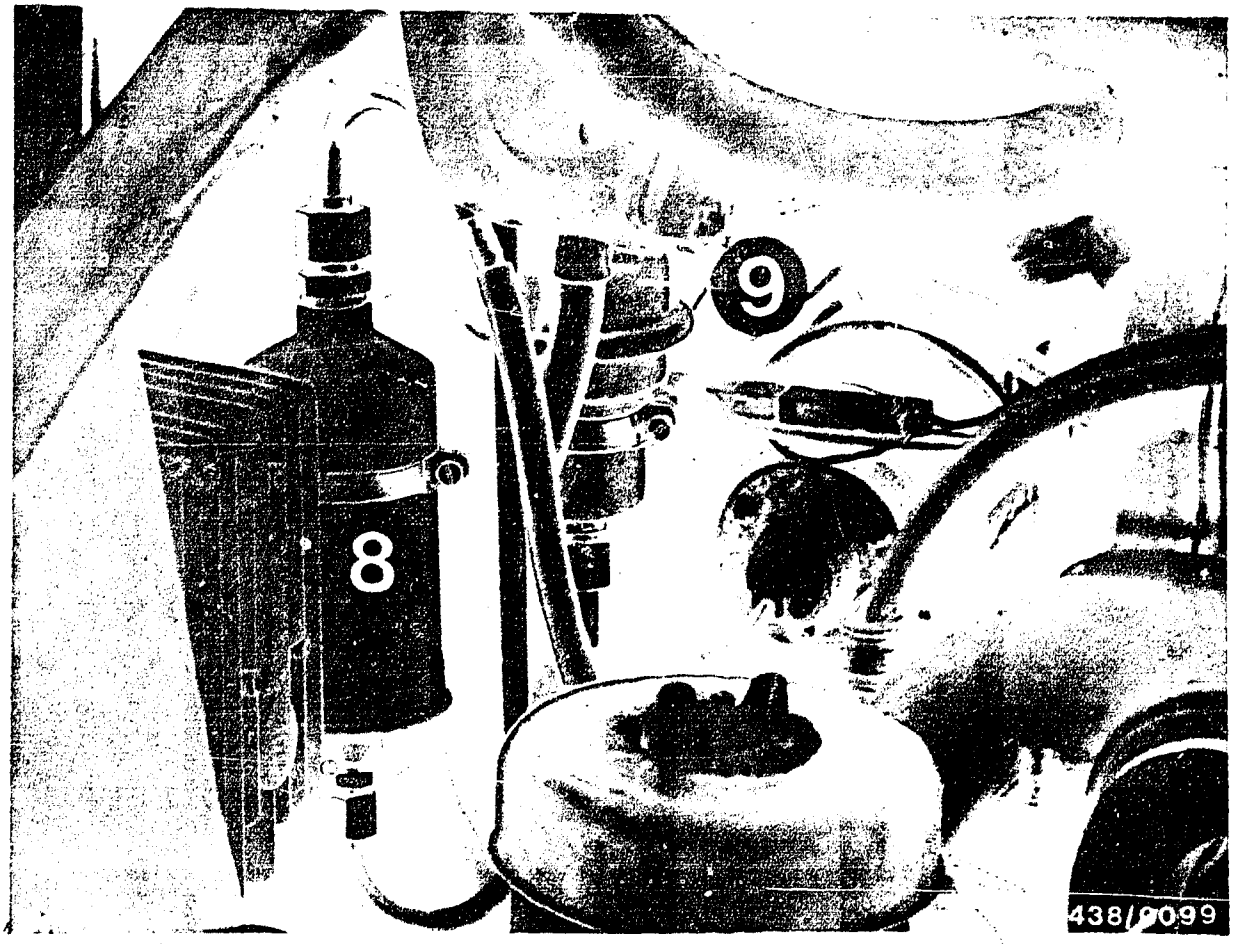
The start valve (not visible in the picture) is mounted on the rear side of the intake housing below the throttle-valve assembly.
The thermo-time switch (likewise not visible in the picture) is located in the engine block below the secondary-air pump.
As from the 1981 model, steel fuel-injection lines are fitted.



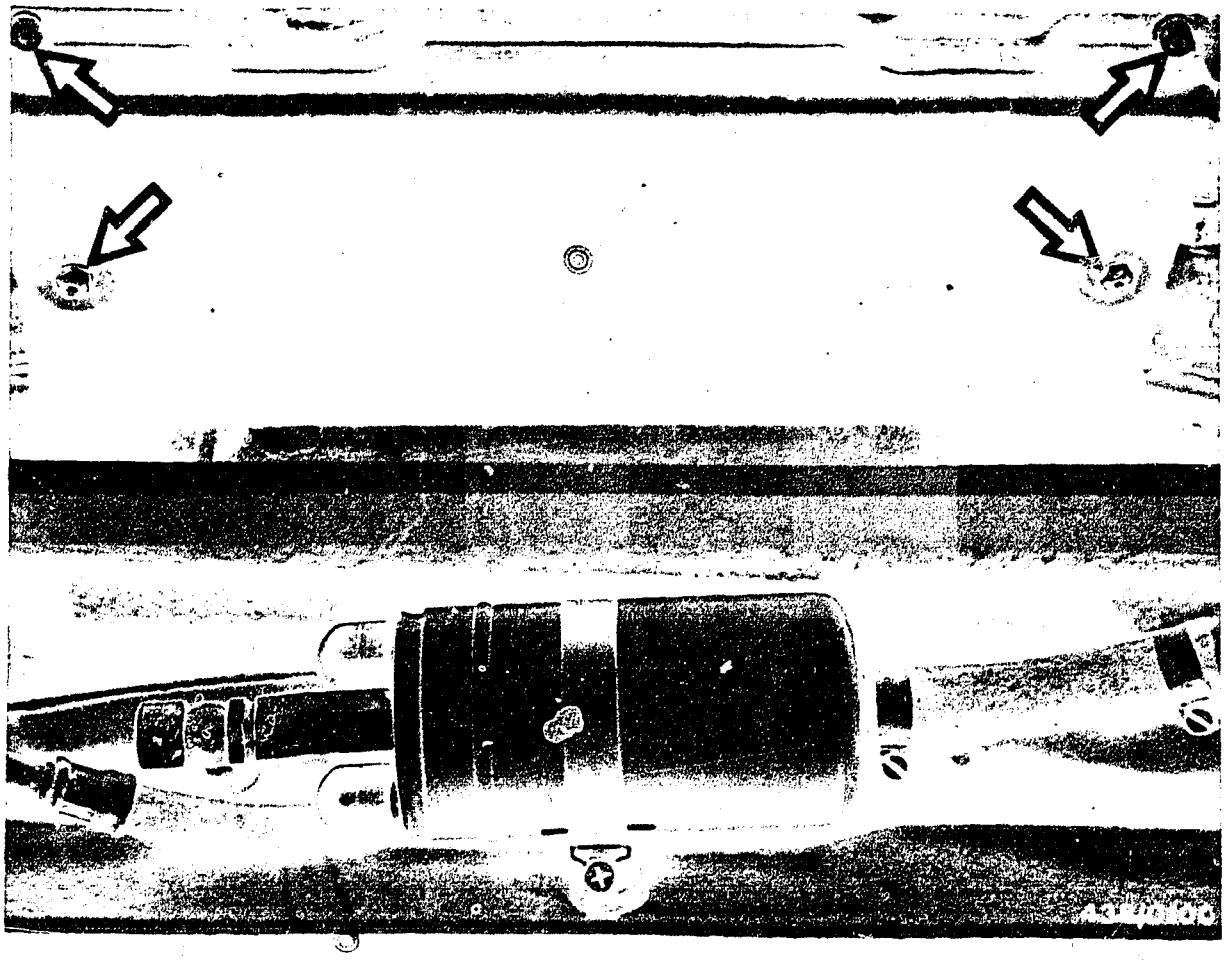
5 = Injection valves; each plugged into the flange of the intake tube.
6 = Auxiliary-air device



7 = Warm-up regulator



8 = Fuel filter
9 = Fuel accumulator



The electric fuel pump is positioned at the front, in front of the front-axle auxiliary support.

The pump is made accessible by removing the dirt-deflector plate (unscrew 2 hexagon-socket-head cap screws and 2 nuts).

Caution:
When re-fitting the dirt-deflector plate, be absolutely sure to read the information in Section 12.6 (starting at Coordinate C 3).

7. Trouble-shooting chart

Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition
2. Engine does not start, or starts poorly, in warm condition*
3. Irregular idling during the warm-up phase (shakes)
4. Irregular idling with warm engine (shakes)
5. Engine does not draw gas, burbles
6. Engine misfires when operating on the road, high load
7. Insufficient power

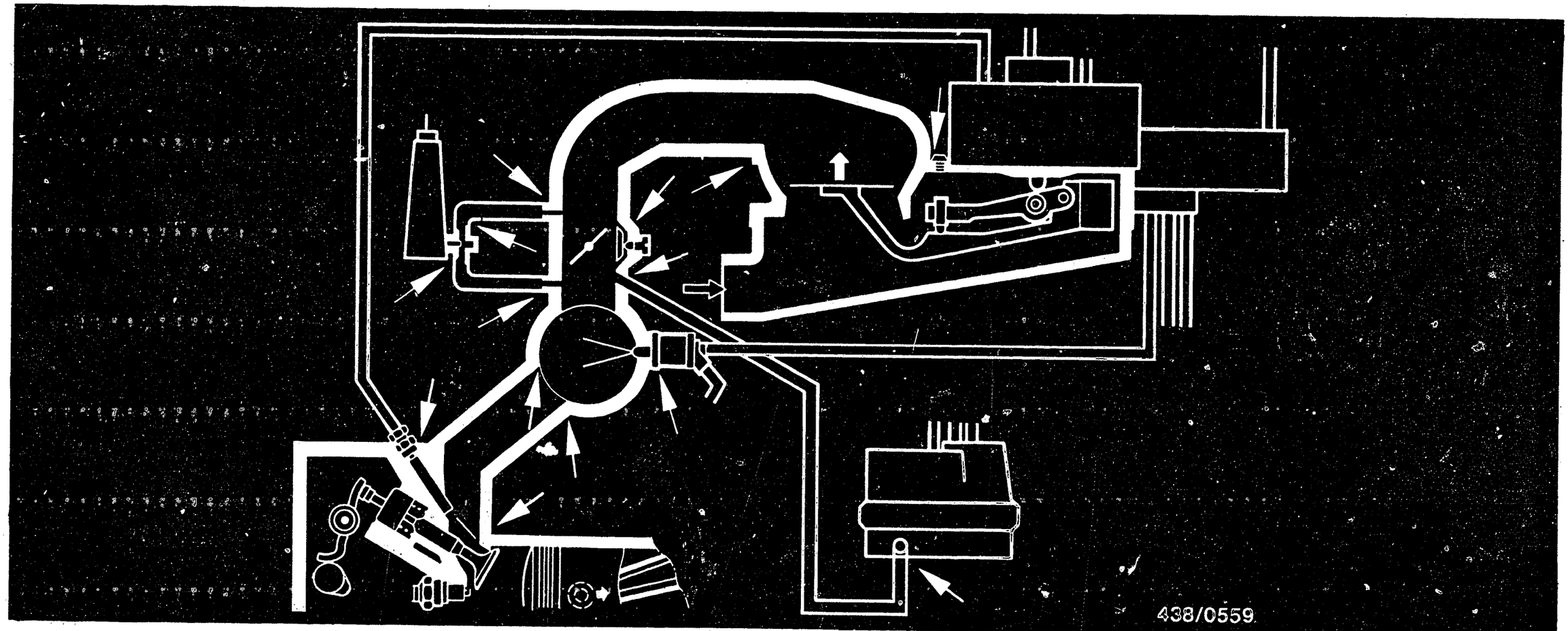
1	2	3	4	5	6	7	Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 7
	●						Position of the air-flow sensor plate incorrect (too high)	B15
●		●					Auxiliary-air device does not open	B20
							Auxiliary-air device does not close	B20
●	●				●		Electric fuel pump not operating	B22
●							Cold-start system defective	C 5
		●	●				Cold-start valve leaking	C 5
●		●					"Cold" control pressure outside tolerance	C11
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C11
			●	●		●	"Warm" control pressure too low (after warm-up)	C11
					●	●	Primary (system) pressure outside tolerance	D12
	●						Overall fuel system leaking	D19
●	●	●	●		●		Injection valves leaking, opening pressure too low	E14
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 4
●	●	●	●	●			Basic idle adjustment incorrect	F20
						●	Throttle plate does not open completely	--

*Note
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinates L 4.

7. Trouble-shooting chart (continued)

Customer complaint (fault system)

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinates
		●		●			Vacuum system leaking	B 5
●		●	●	●			Air-flow sensor lever and/or control plunger not moving smoothly	B 7
●							Position of the air-flow sensor plate incorrect (too low)	B15
							Auxiliary-air device does not open	B20
					●		Auxiliary-air device does not close	B20
						●	Electric fuel pump not operating	B22
							Cold-start system defective	C 5
●	●		●				Cold start valve leaking	C 5
							"Cold" control pressure outside tolerance	C11
		●				●	"Warm" control pressure too high (after warm-up)	C11
	●	●	●			●	"Warm" control pressure too low (after warm-up)	C11
		●				●	Primary (system) pressure outside tolerance	D12
							Overall fuel system leaking	D19
●							Injection valves leaking, opening pressure too low	E14
		●					Unequal fuel delivery (imbalance of fuel delivery)	F 4
●	●	●	●	●			Basic idle adjustment incorrect	F20
							Throttle plate does not open completely	--



Working steps

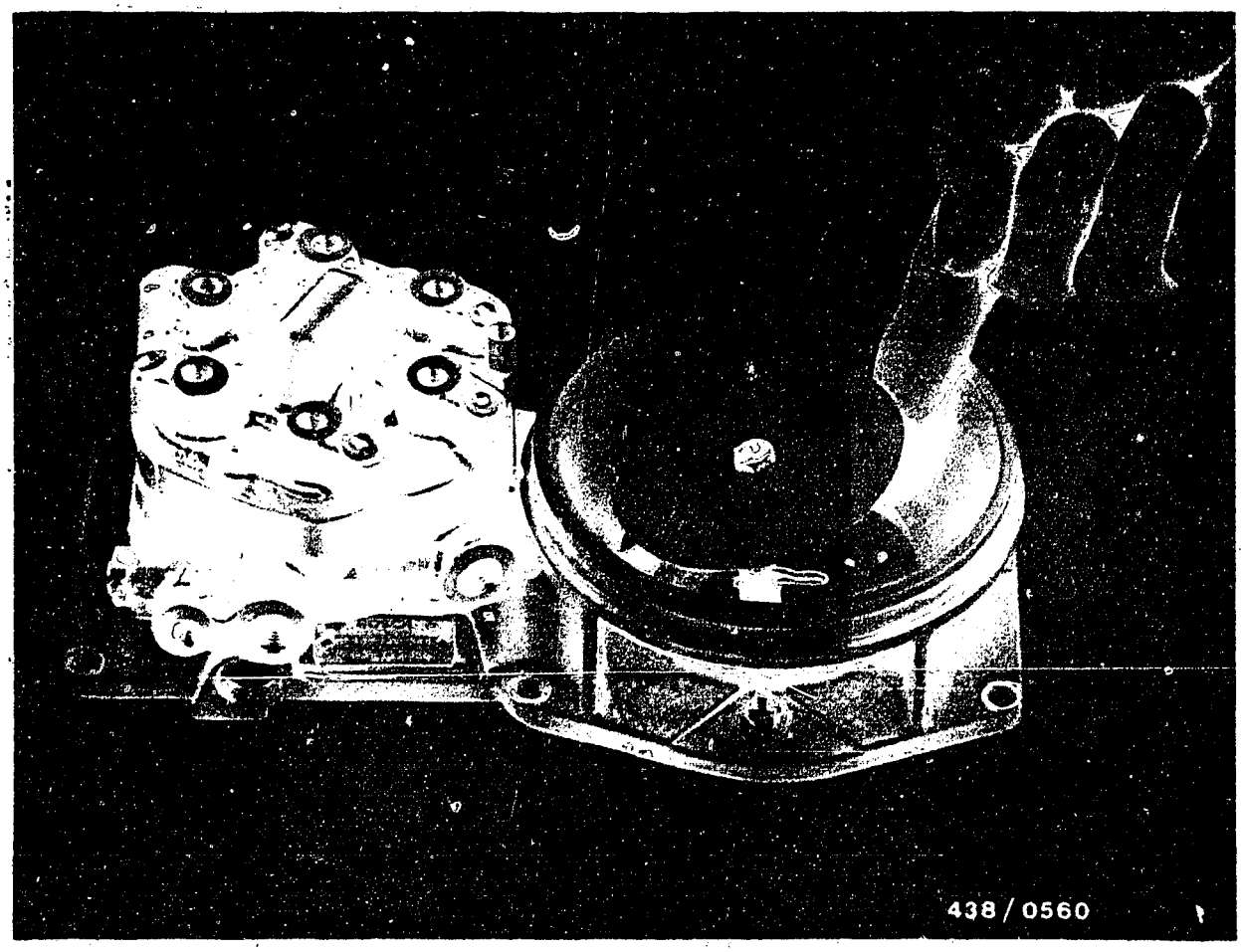
8. Check the air-intake system of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur.
Not to be seen in the picture but also to be checked: Seal on oil tank cover.
Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).

Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature: Idle-speed adjustment is described on Coordinates F 20.

B5 | Leak test on air-intake system | Porsche 911 SC, 1978...1981 model | ➡

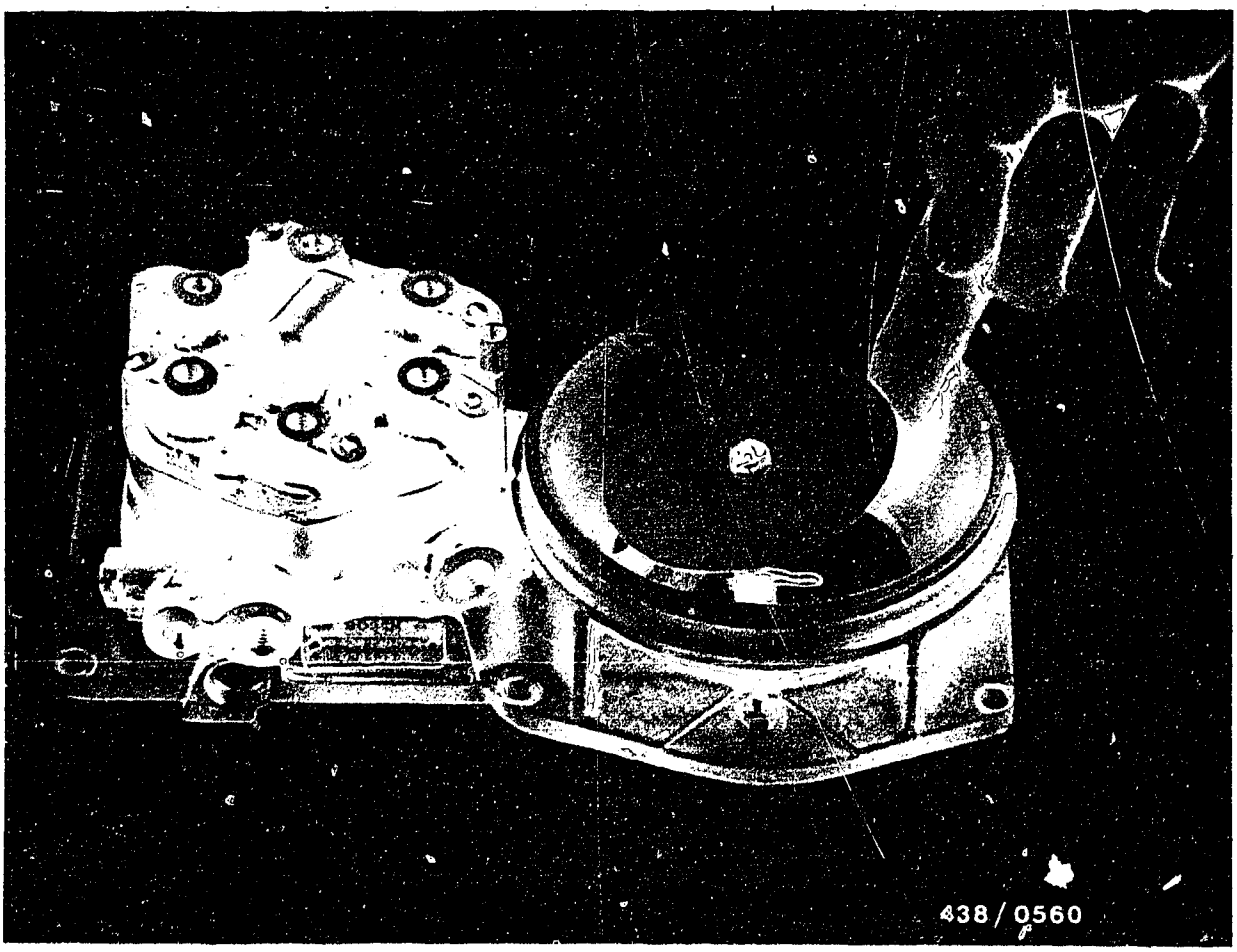
B6 | Leak test on air-intake system | Porsche 911 SC, 1978...1981 models | ⬅



9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

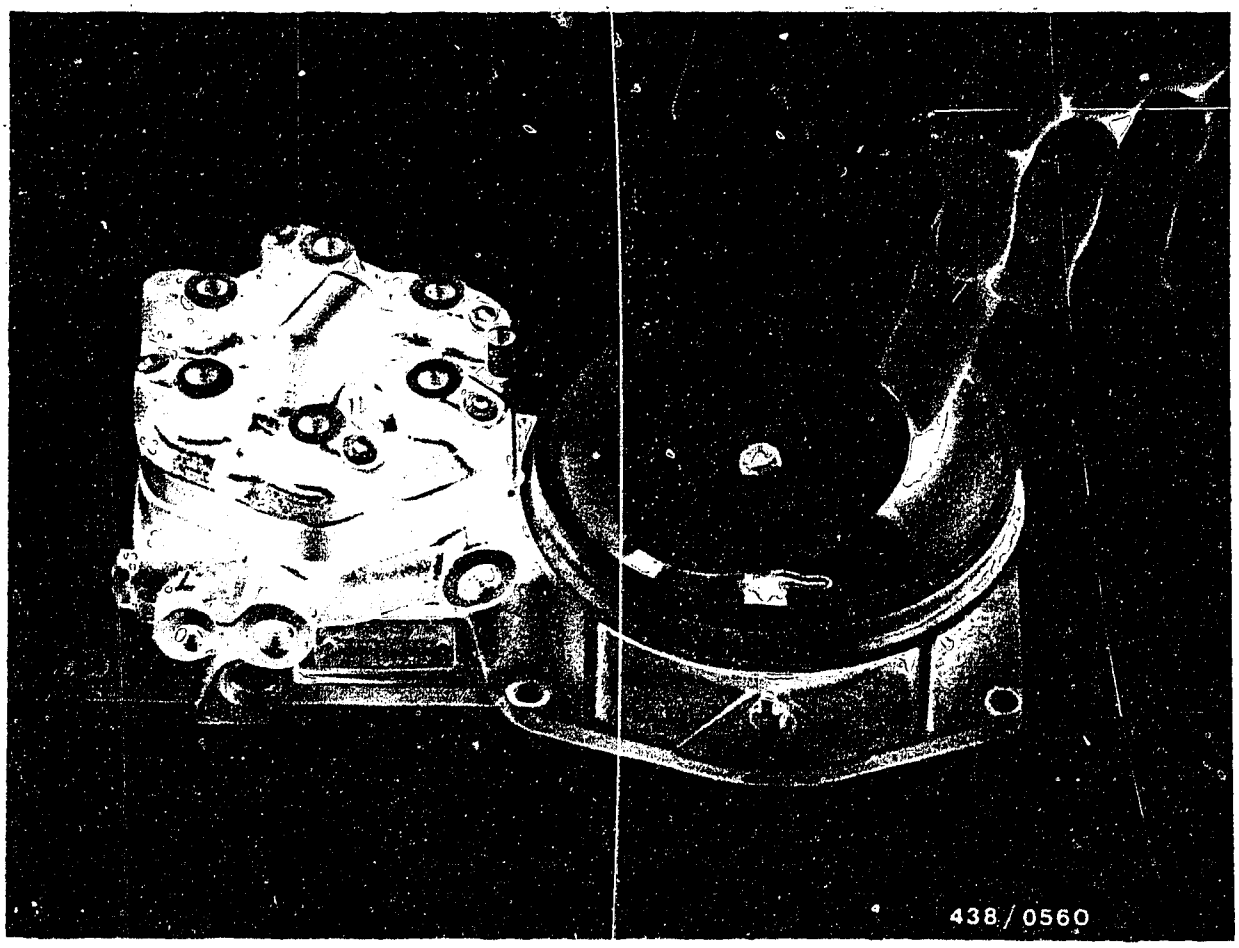
Engine temperature not below +20°C.
Remove the rubber hood between air-flow sensor and throttle-valve assembly so that the air-flow sensor plate becomes accessible.
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.



9.2 Check that the control lever moves freely

Raise the air-flow sensor plate by hand and release again.
The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop.

If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Porsche parts).
Tighten the screws uniformly cross-wise until springs are blocked together, then release again by one turn.
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely.

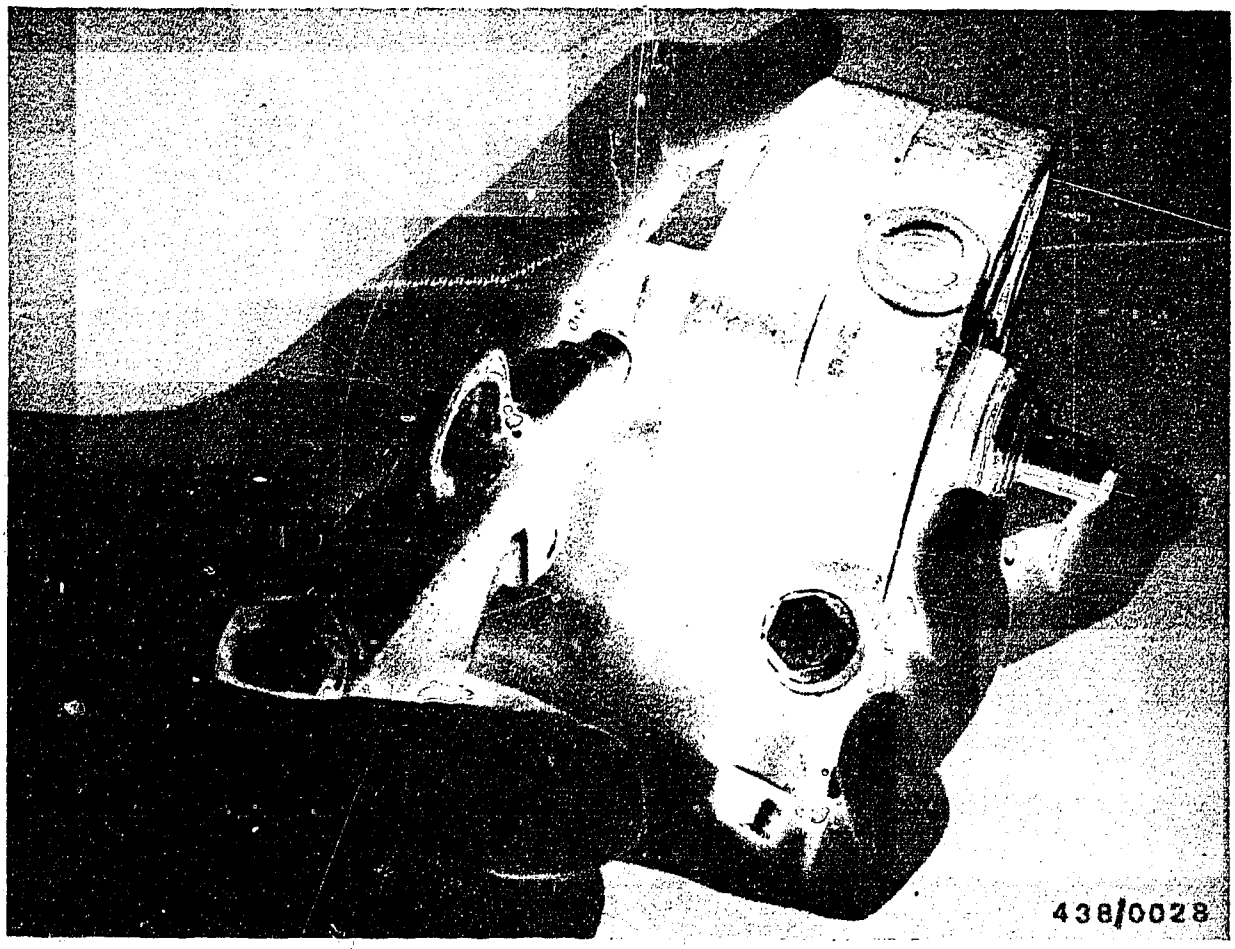
Raise the air-flow sensor plate by hand. The same resistance must be felt over the entire movement. Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely. If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!
Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

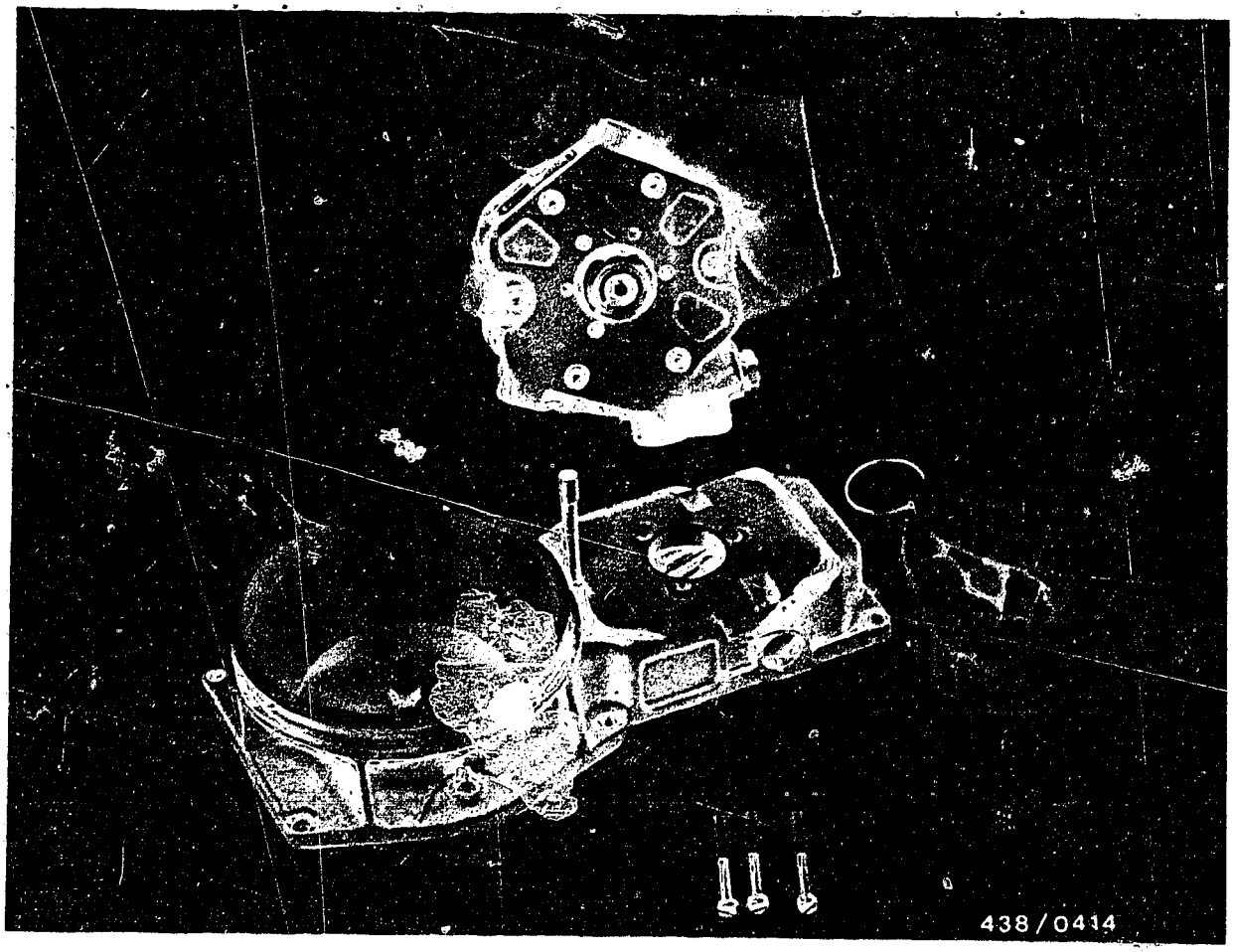
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.

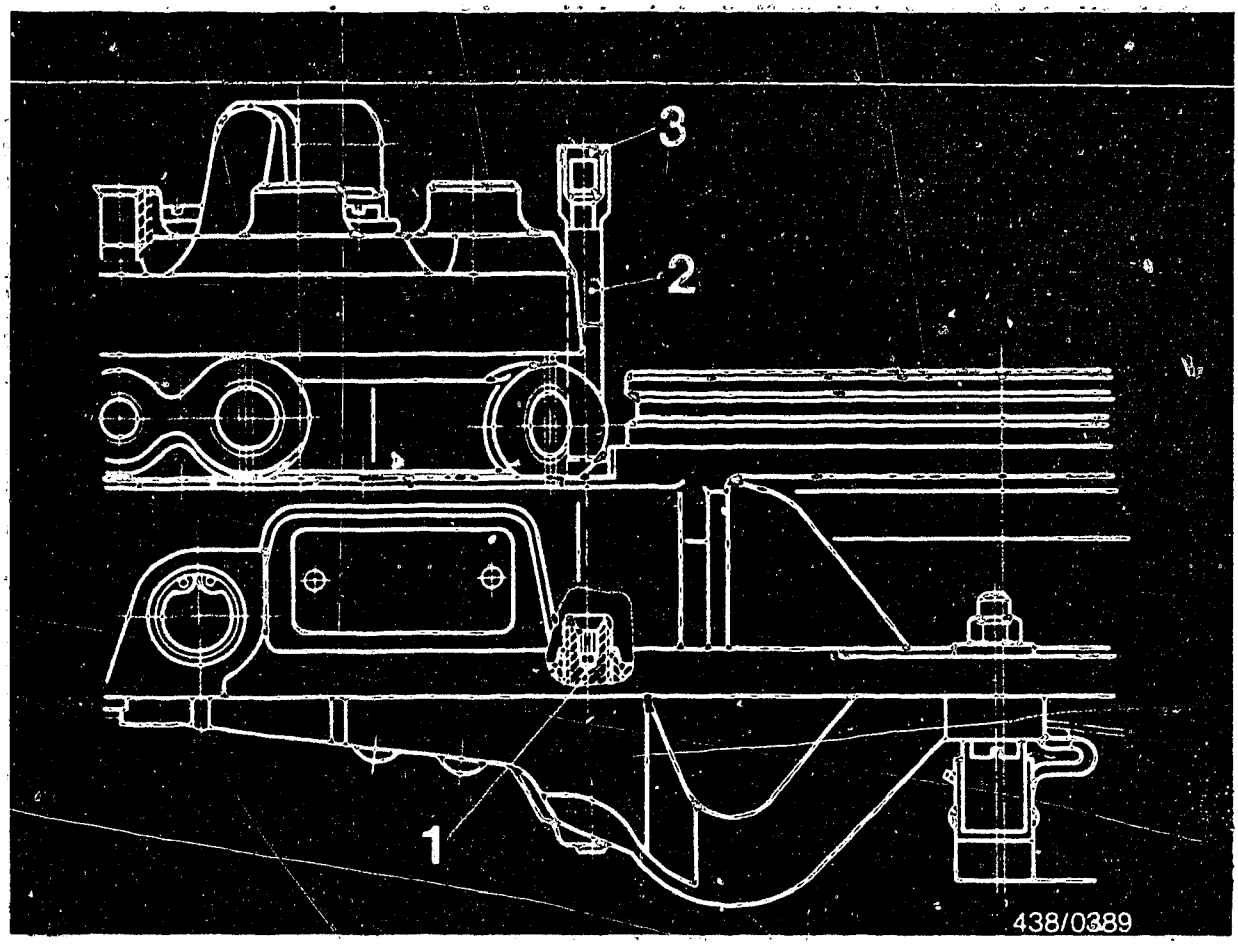
The steel tubes must not be bent.

Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.



9.4 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32...0.38 kgfm) for the fastening screws precisely.
When connecting the fuel-injection tubing, use new seal rings.

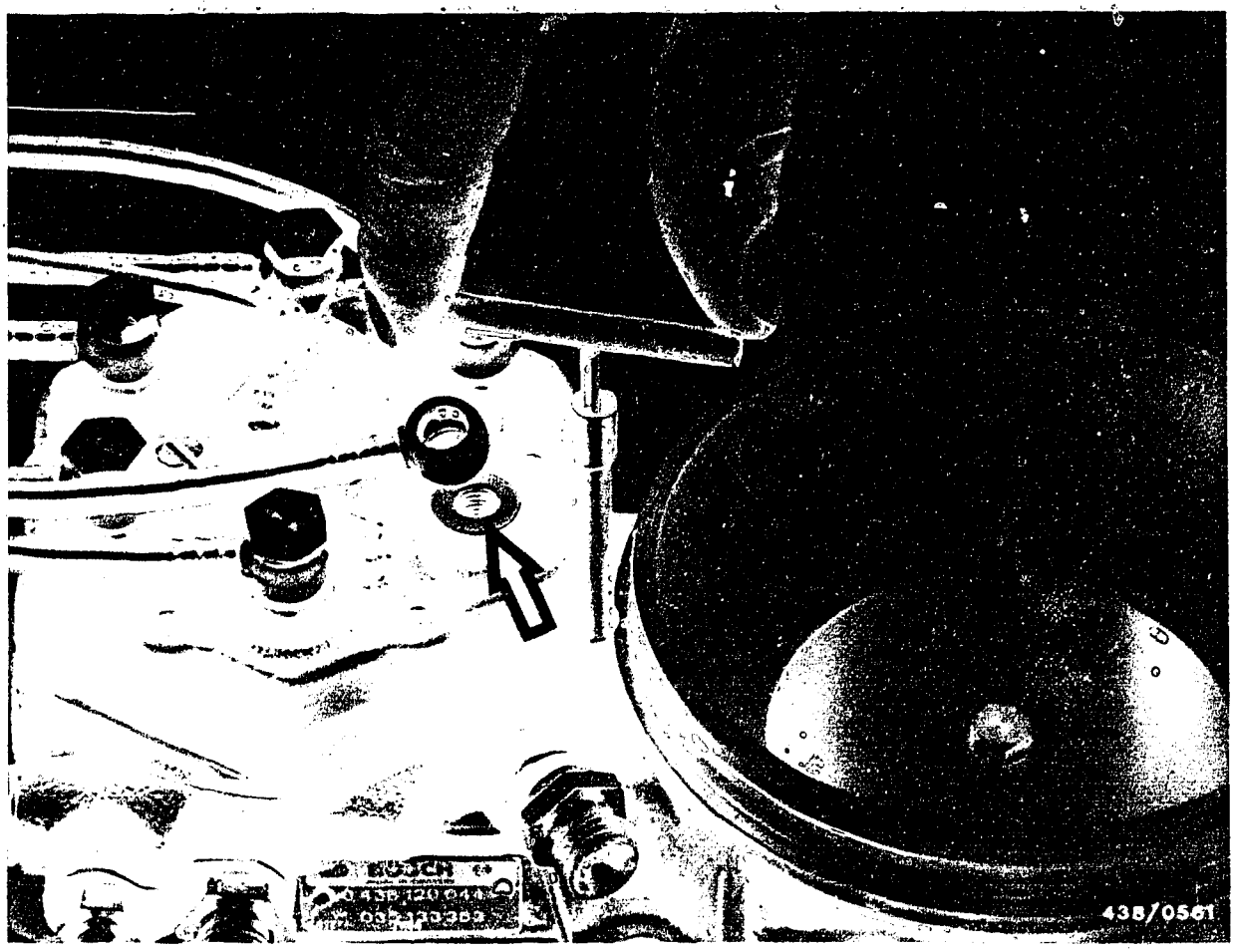


1 = Idle-mixture-adjusting screw
2 = Guide tube
3 = Lead seal

9.5 Matching the fuel distributor to the air-flow sensor for initial starting:

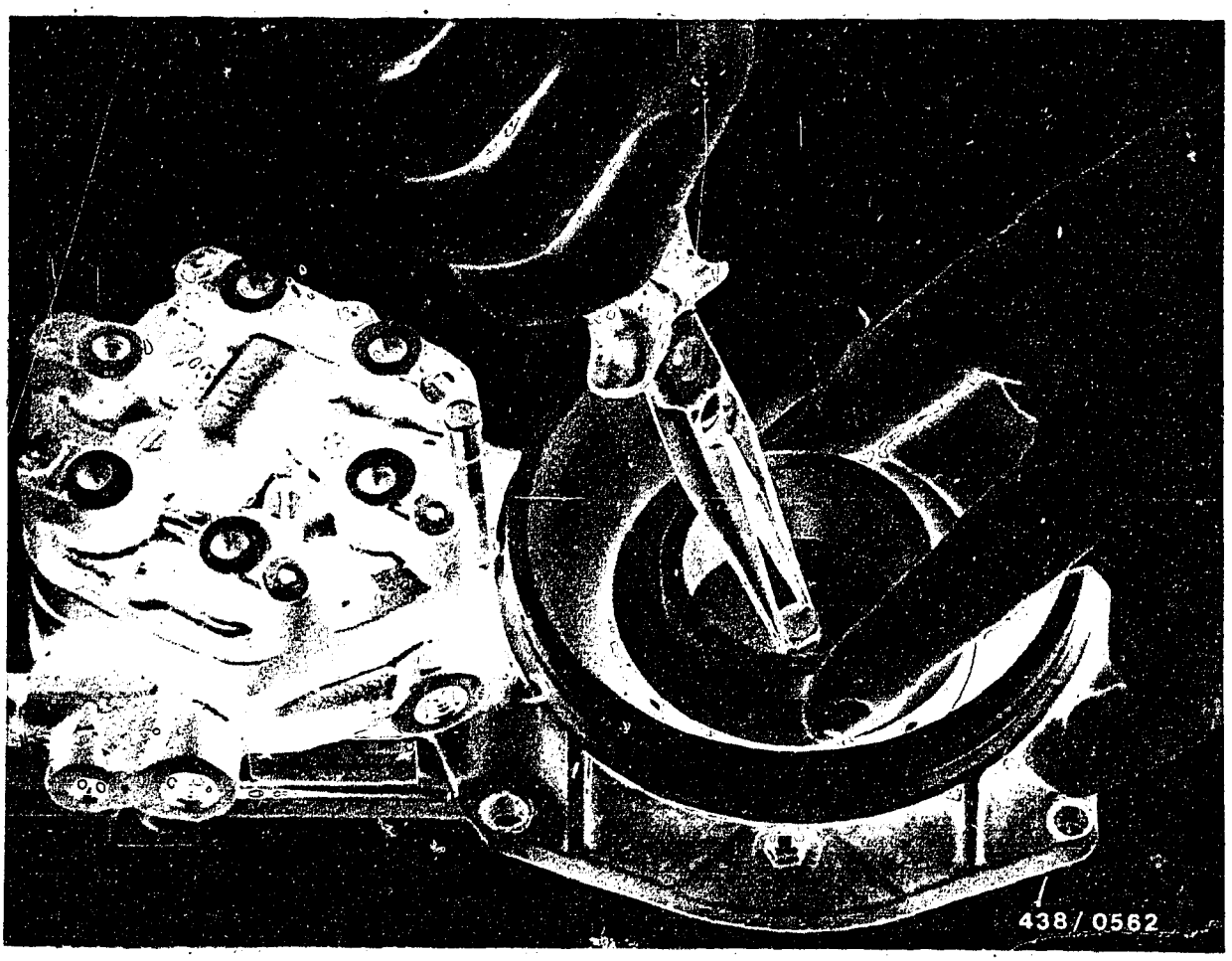
Screw off one fuel-injection line from the fuel distributor.
Remove anti-tamper device (lead seal) of the idle-mixture-adjusting screw. Introduce adjusting wrench KDEP 1035 through the hole until it locks in position in the idle-mixture-adjusting screw.

Bridge the electrical safety circuit so that the electric fuel pump operates.



Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.
The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F20.



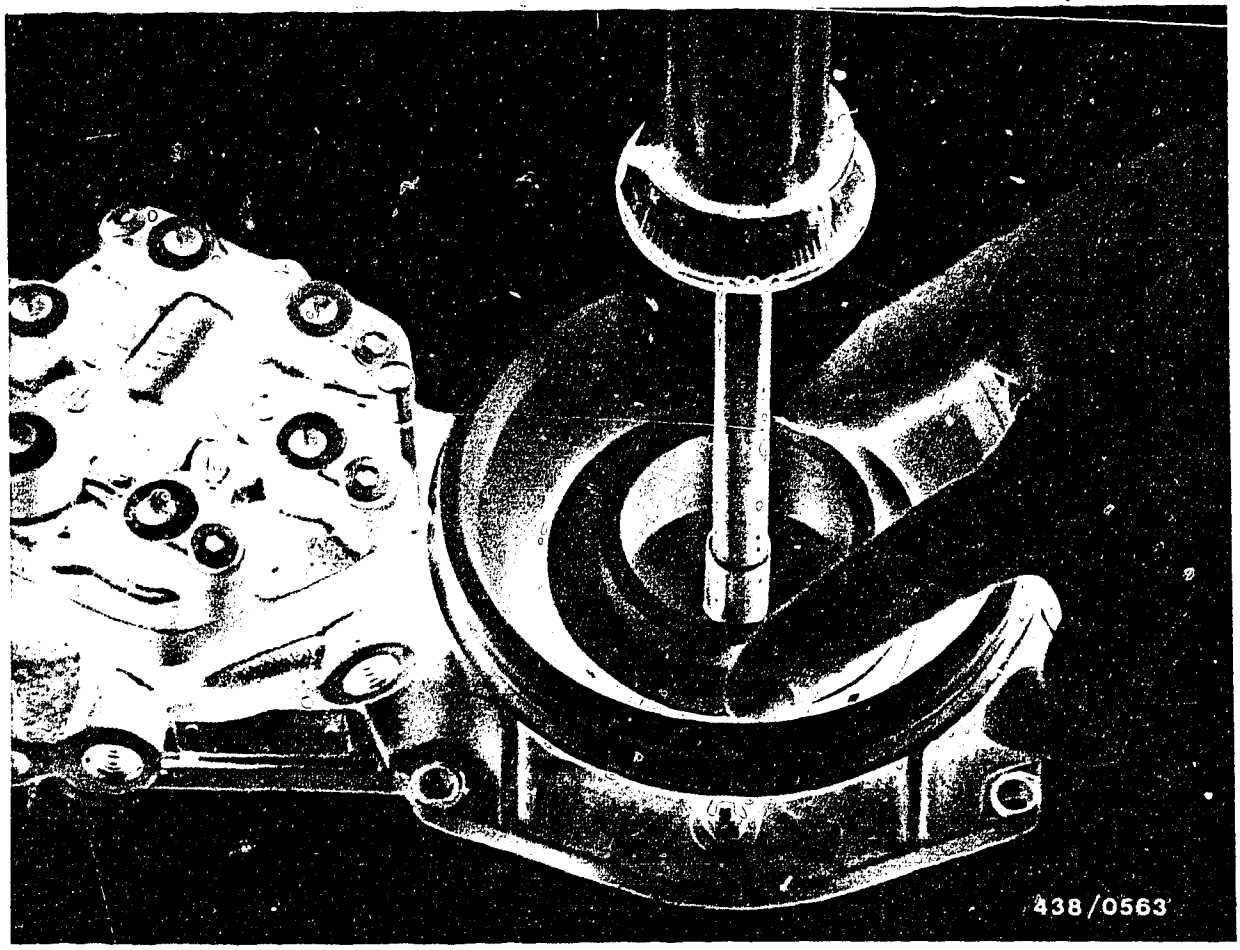
10. Checking and adjusting the position of the air-flow sensor plate

- Engine temperature is not important.
- Remove the rubber hood between air-flow sensor and throttle valve assembly (release 2 rubber bands), so that air-flow sensor plate and adjusting lever become accessible.

10.2 Centering the air-flow sensor plate

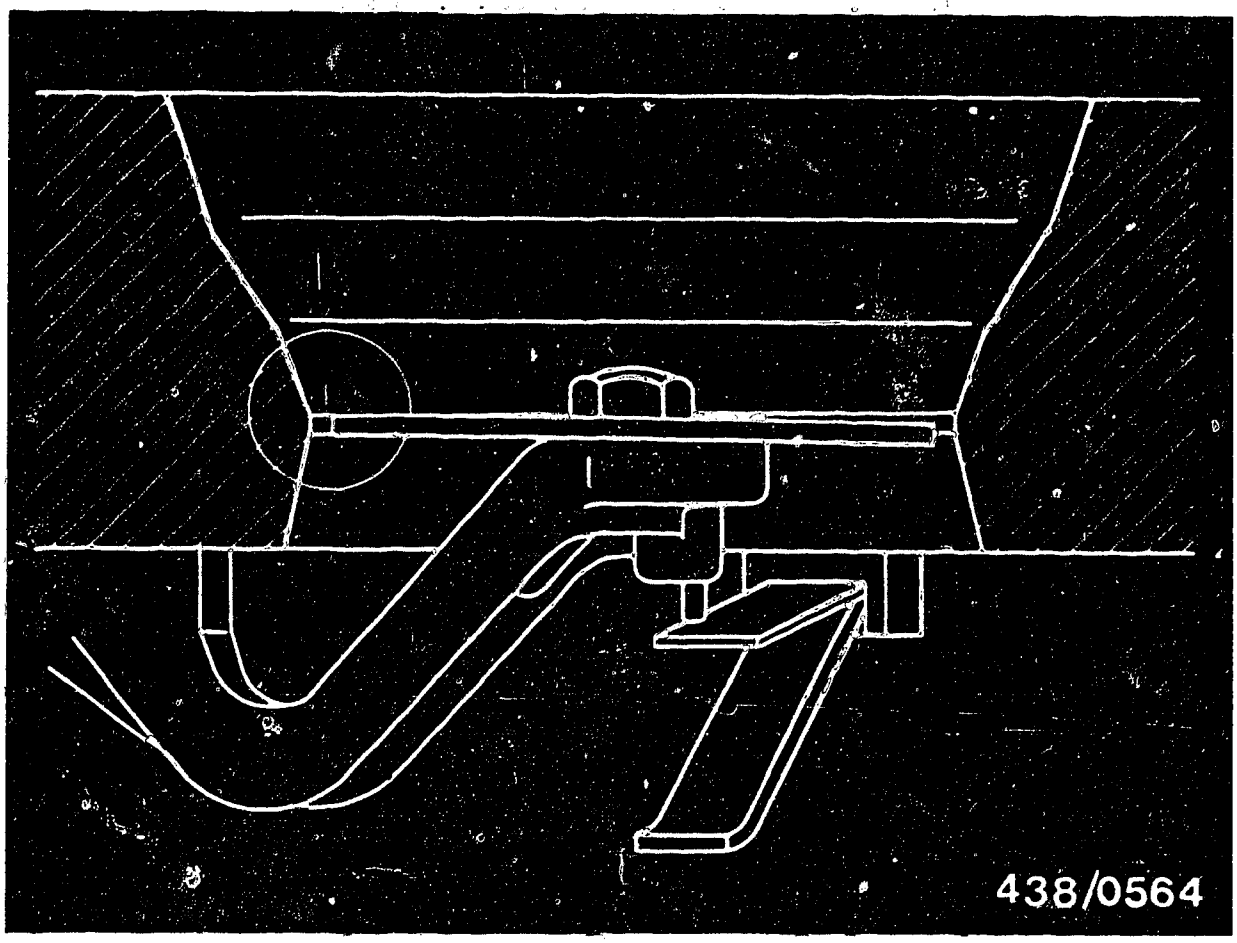
Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:

Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).
It must no longer be possible to turn the air-flow sensor plate by hand.

Caution:
The lower edge of the sensor plate is partially chamfered. In order to ensure that the sensor plate is correctly mounted, its upper side is identified either by the inscription "top" or by five punch marks in a row.



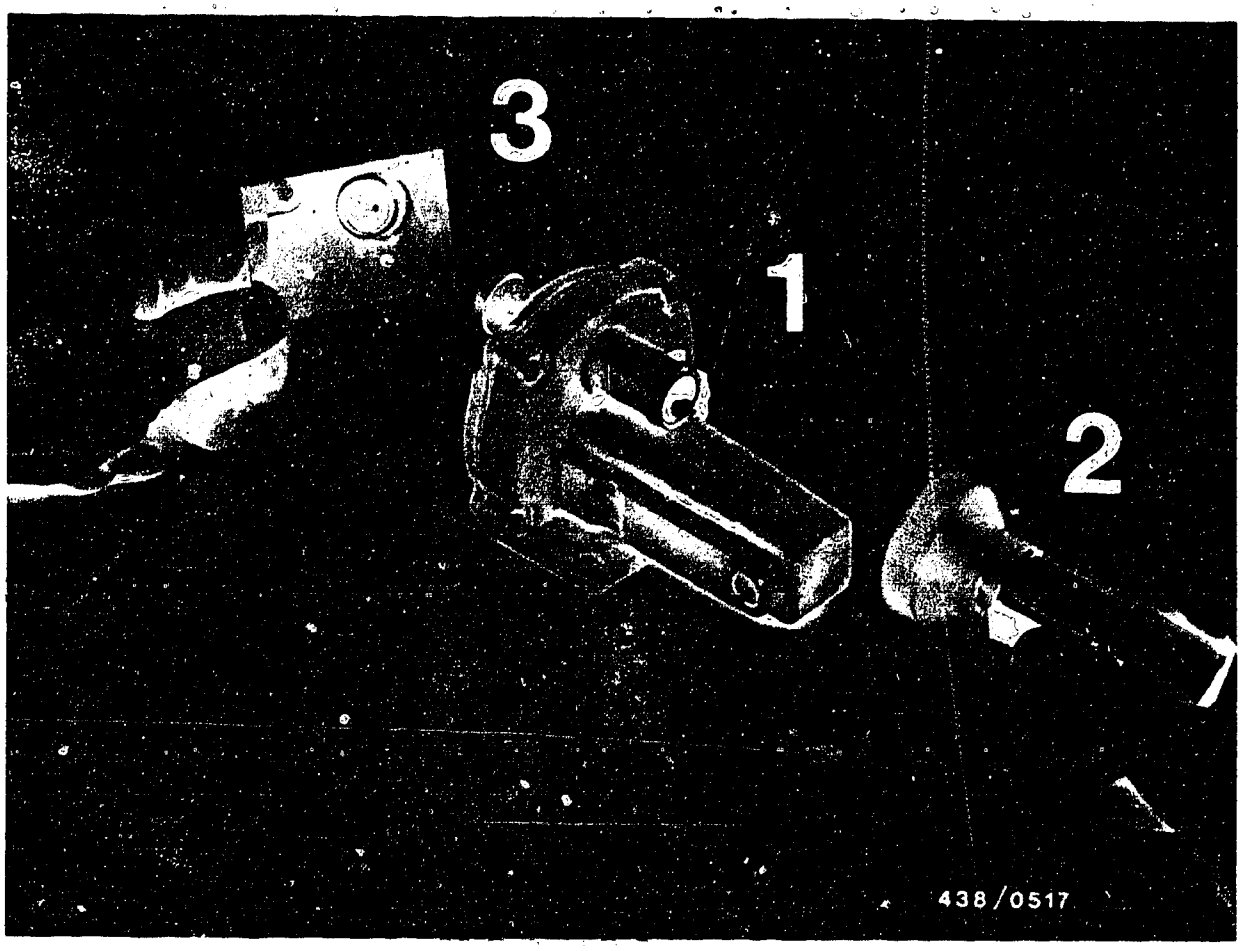
10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the final distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone in the position shown in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.

1 = Adjusting screw
2 = Control lever

Adjust the position of the air-flow sensor plate at the adjusting screw (instead of the usual shaped spring) on the stop bracket. Tighten the lock nut of the adjusting screw after each adjustment.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auxiliary-air device.

The engine must be cold.
Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.

Disconnect both air hoses from the auxiliary-air device. Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.

It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

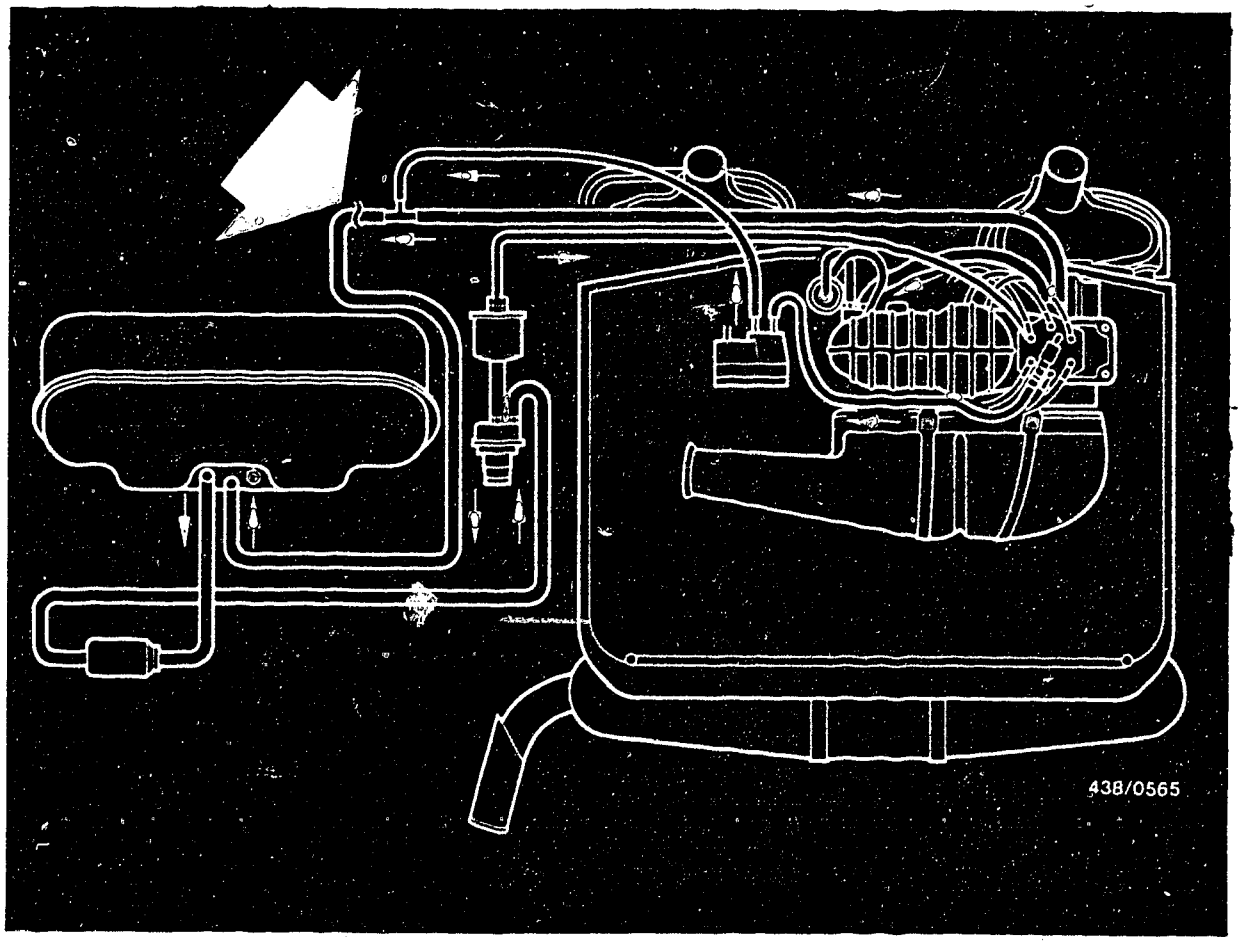
If an opening is not visible with the engine cold, replace the auxiliary-air device.
Fit the electric cable plug on the auxiliary-air device. By bridging the electrical safety circuit, supply power to the auxiliary-air device.

After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

If the blocking plate does not close, check the power supply (open circuit, voltage drop).
Minimum voltage across the connector 11.5 V with the engine stopped.

If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.
Replace the auxiliary-air device if defective.

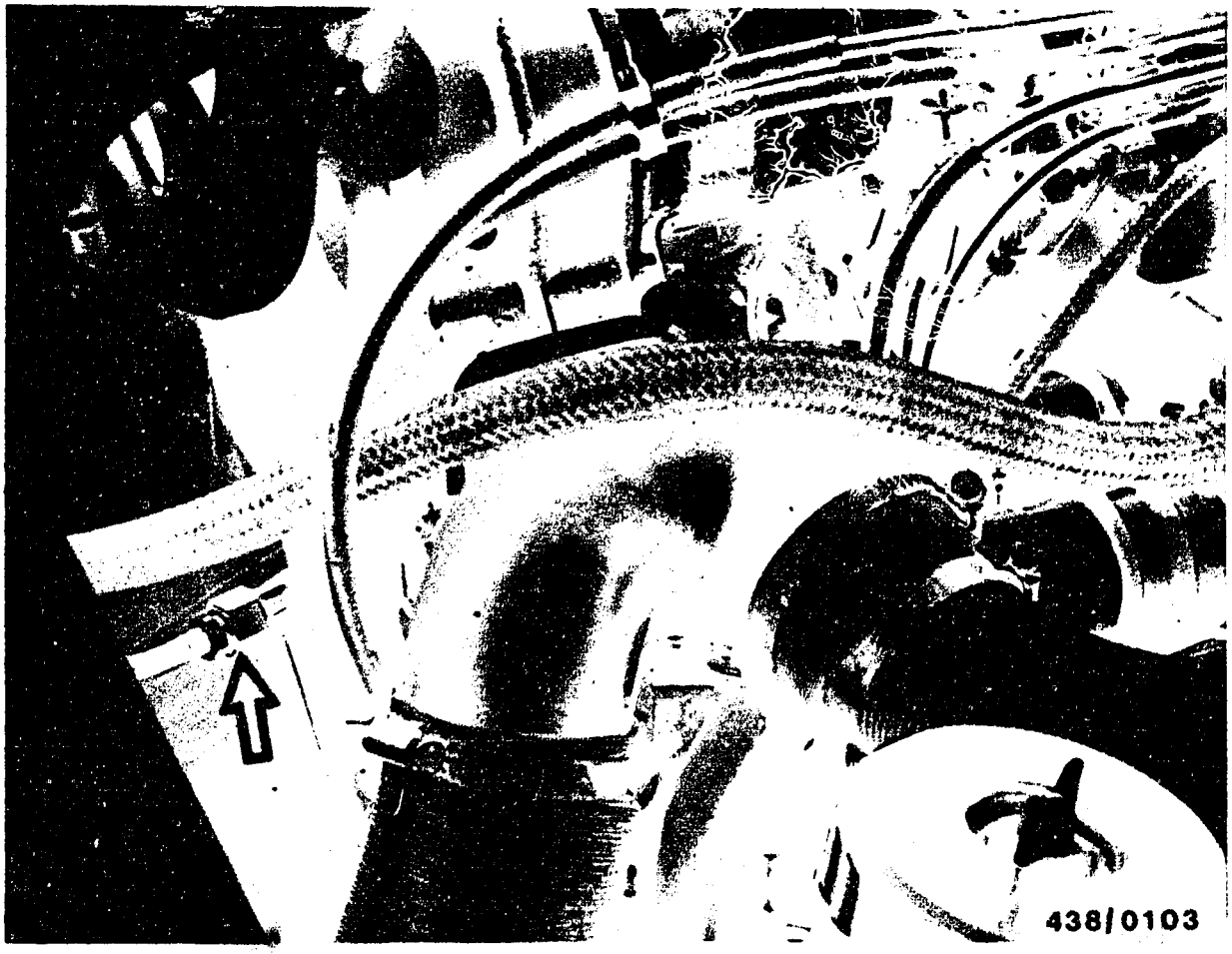
Idle-speed adjustment is described on Coordinates F 20.



12. Checking the operation of the electric fuel pump.

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Measuring point

The measuring point for fuel-delivery testing is the screw connector in the fuel return line (arrow). Undo the connector and connect the test hose to the end of the line fastened by a bracket.
Hose nipple on test hose with male thread M 14x1.5 and 60° internal taper.

12.3 Testing

Since the measurement is performed with the engine stationary, switch on the electric fuel pump while testing by bridging the electrical safety circuit.

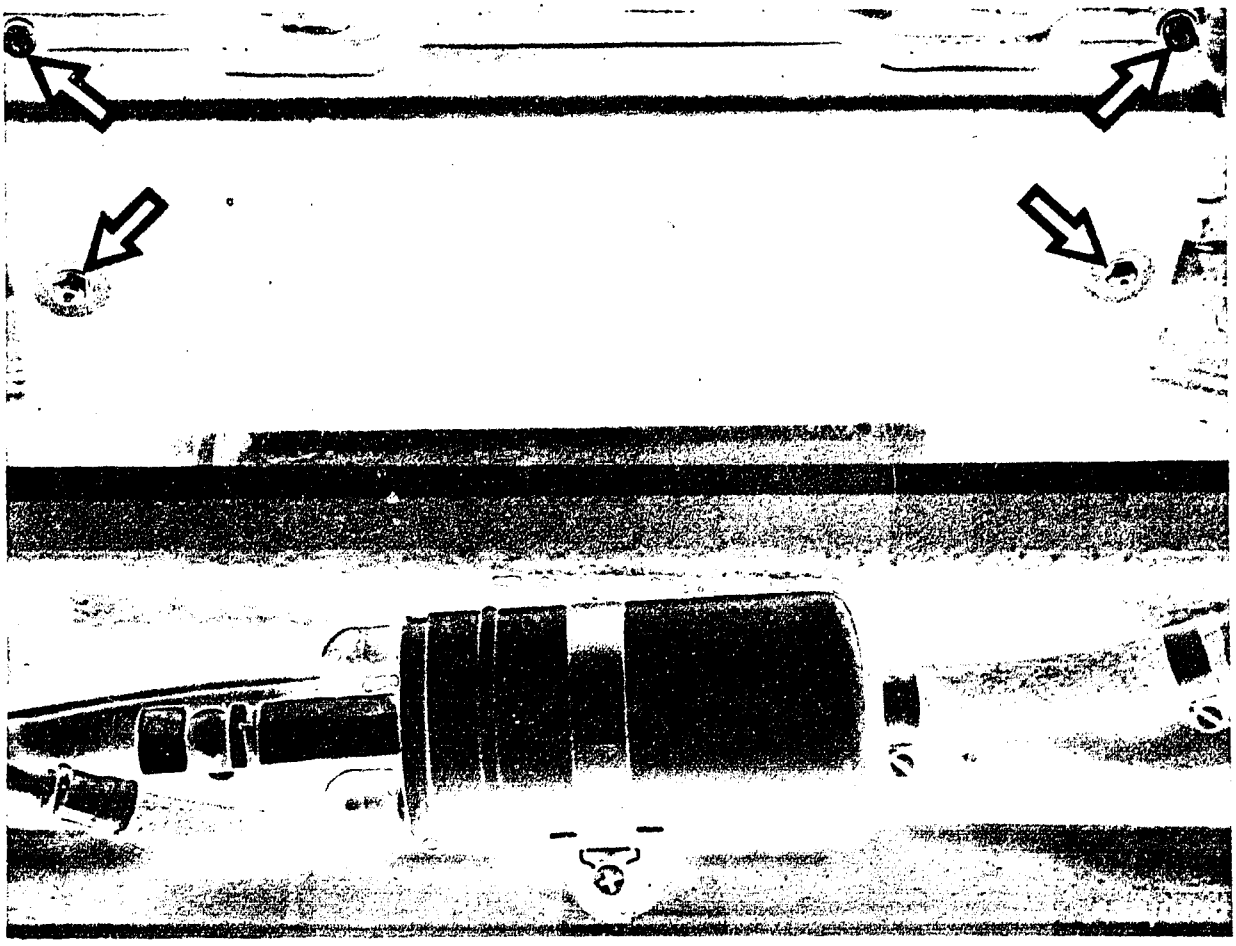
12.4 Test specification:

Fuel delivery: at least 1050 cm^3/30 seconds.

12.5 Possible causes of insufficient fuel delivery:

- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.

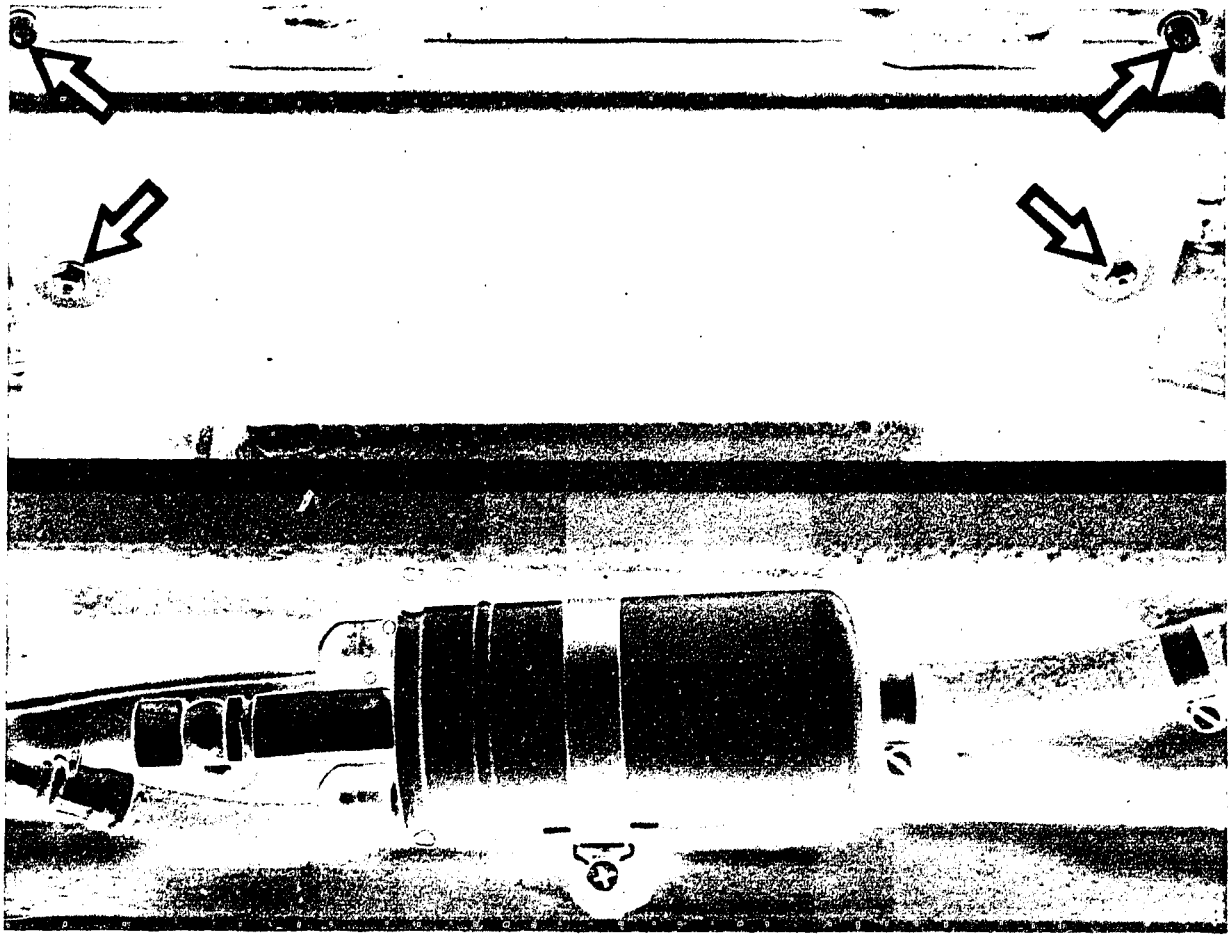
If these points are O.K., the fault lies in the electric fuel pump itself. Replace the electric fuel pump.



12.6 Removing and installing the electric fuel pump:

Remove the dirt-deflector plate from the front-axle auxiliary support (unscrew 2 hexagon-socket-head cap screws and 2 nuts).
Pinch off the intake hose before loosening (e.g. using hose clamper W 157 from Matra Co.) so that no fuel can escape.
Remove the delivery line and the electric terminals, loosen the clamping band and remove the pump.

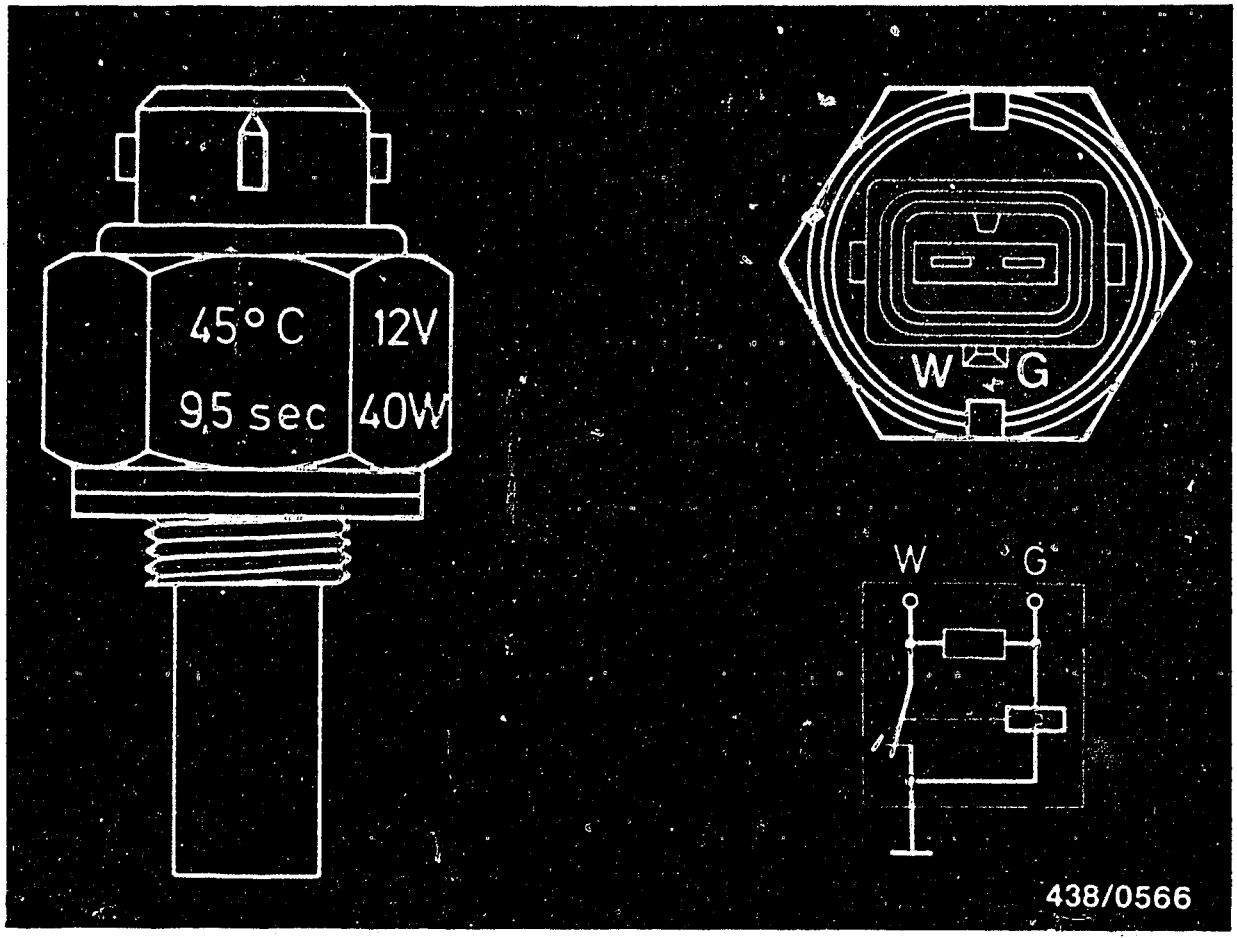
When installing, make sure that the pump does not touch the fuel tank, front-axle auxiliary support or body.
Connect the delivery line with new seal rings.
Re-fit the dirt-deflector plate.



Caution:

The fastening screws and nuts are at the same time fastening elements for the front-axle auxiliary support and the anti-roll bar.
Therefore, when fitting the dirt-deflector plate, be sure to observe the specified tightening torques for the screws and nuts.

Hexagon-socket-head cap screws = 47 Nm (4.7 kgfm)
Self-locking nuts = 28 Nm (2.8 kgfm)
After the nuts have been removed several times they will lose their self-locking characteristic (nuts can easily be turned).
Therefore, if necessary, use new self-locking nuts.



13. Checking the cold-starting system (thermo-time switch, start valve).

13.1 Thermo-time switch:

The thermo-time switch must be removed for testing.

It is located in the engine block below the secondary-air pump/ignition distributor. It may be necessary, for improved accessibility, to remove the ignition distributor.

The thermo-time switch used in the Porsche 911 SC model* has a switching temperature of 45°C and a switching time at -20°C of 9.5 seconds. Both values are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term "G" and "W"
+40		30...40	0	30...40
	+50	55...85	120...160	55...85

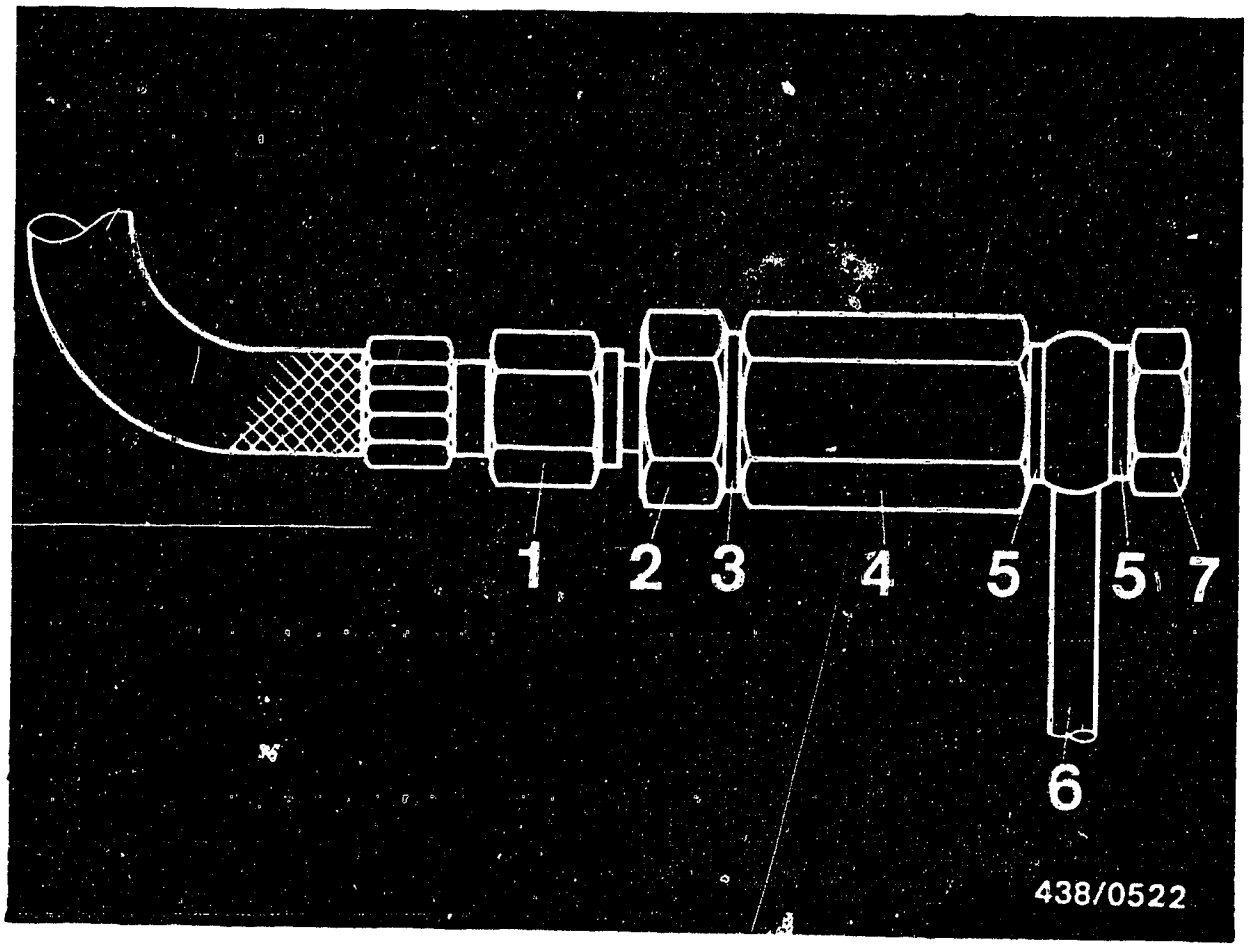
* (non-Bosch product)

13.2 Start valve:

Remove the start valve for testing. It is fitted on the rear side of the intake housing below the throttle-valve assembly. For removing and installing it is advisable to use a mirror so that the connections and fastening screws can be seen.

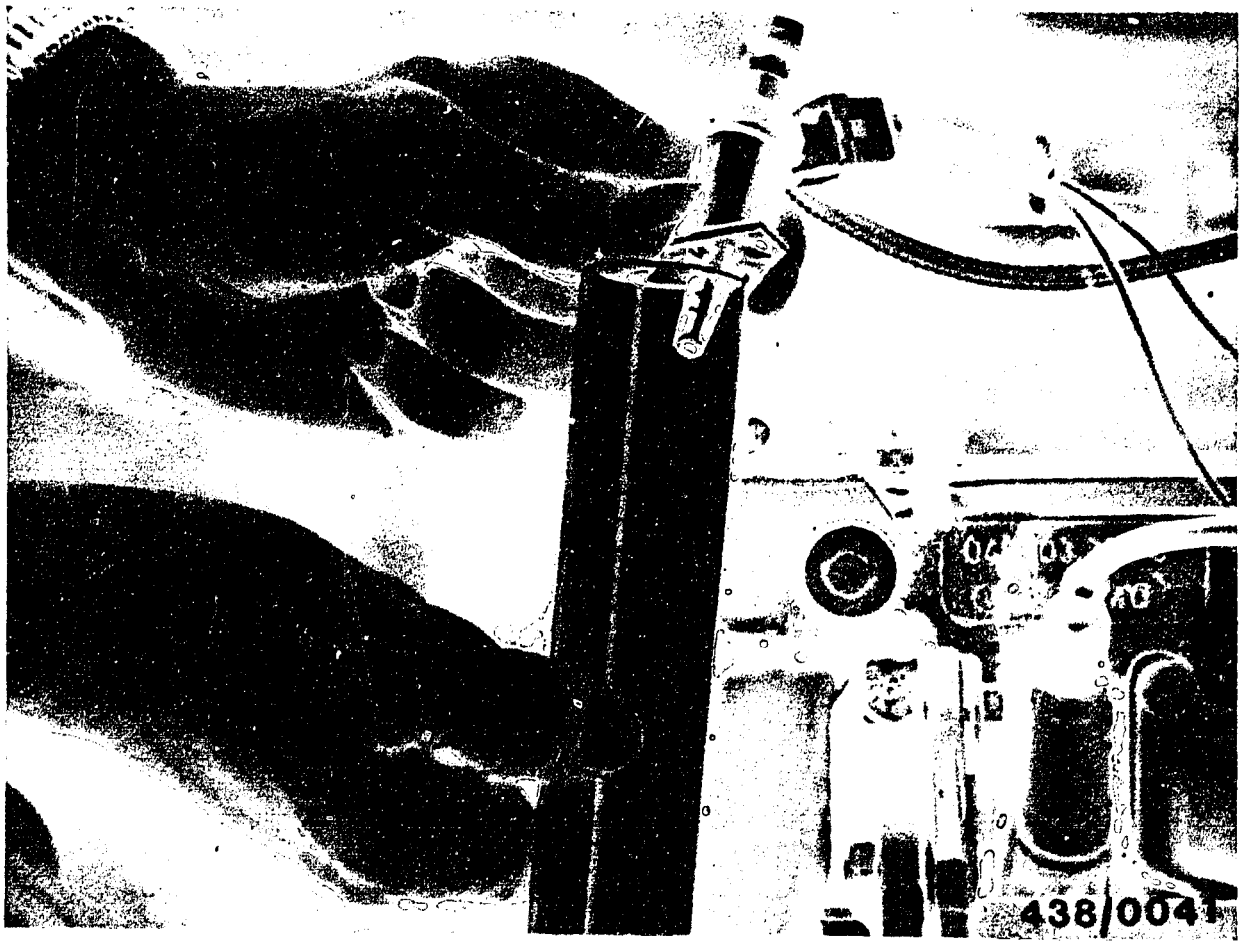
On the 1978-1980 model the fuel line remains connected for testing (polyamide line).

On the 1981 model (steel line) unscrew the fuel line from the valve and re-connect as follows using a flexible hose line:



1 = Hose line of pressure tester KDJE-P100
2 = Double threaded fitting 2 x M 12 x 1.5, 1 x 60° internal taper
3 = Seal ring
4 = Adapter from connecting-parts set KDJE-P100/10
5 = Seal ring
6 = Fuel line
7 = Original inlet-union screw

Connect fuel line with original inlet-union screw to the adapter from the connecting-parts set KDJE-P 100/10 (formerly KDEP 1034/10). Screw a commercially-available double fitting 2 x M 12 x 1.5 into the adapter. Connect a hose line of the pressure tester KDJE-P 100 (formerly KDEP 1034) to the double fitting.



Connect start valve to hose line using connecting piece M 12x1.5/M 8x1 from connecting-parts set. Connect start valve directly to ground and terminal 15 (e.g. on ignition coil) using connecting line KDJE 7450/70.

<u>Important note: During this test, do not let the connecting cable touch B +. Danger of fire due to sparking!</u>

Hold the start valve in a suitable container (e.g. the graduate).
Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.

The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.

Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 20.

14. Checking the control pressures

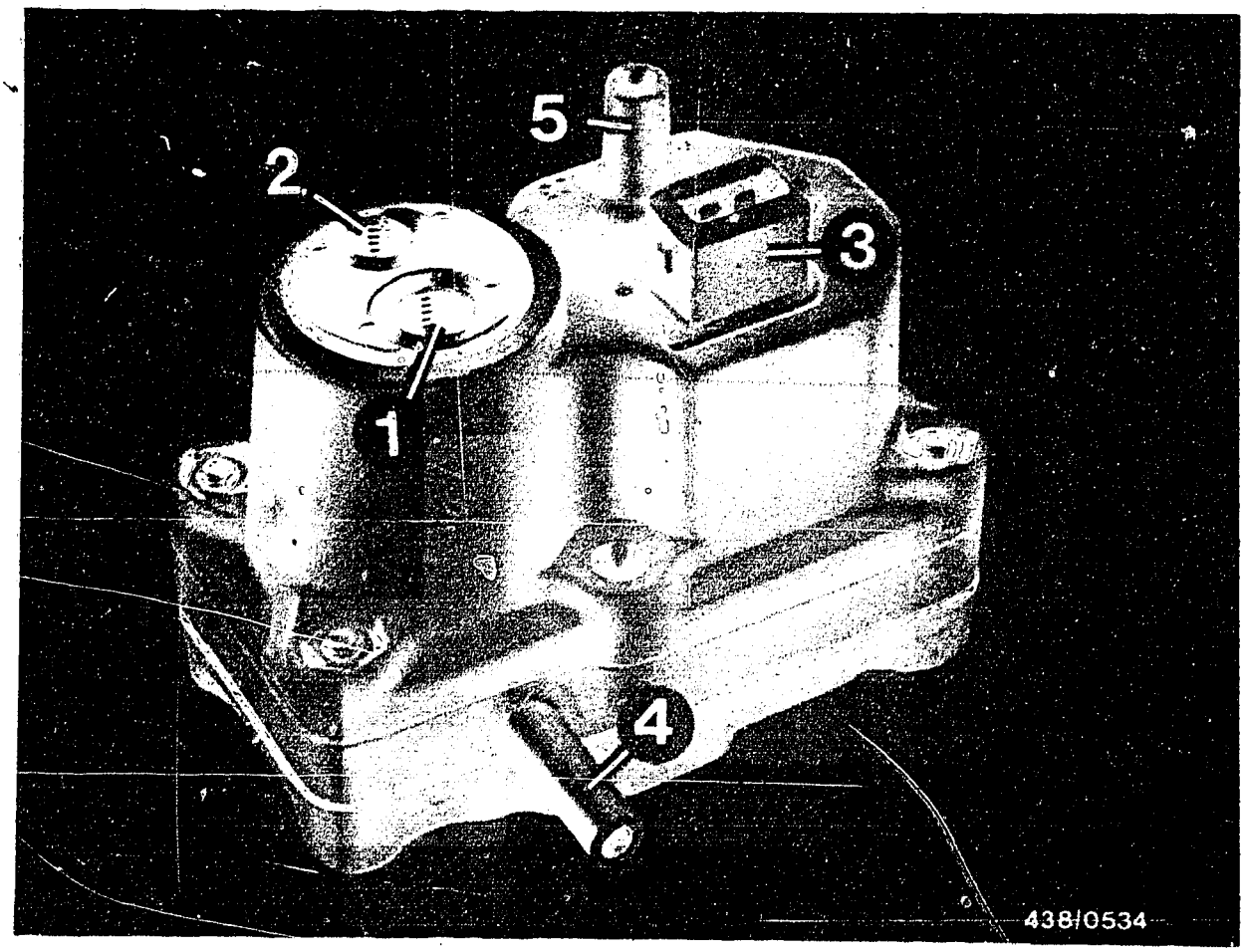
14.1 Preliminary remarks:

The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.

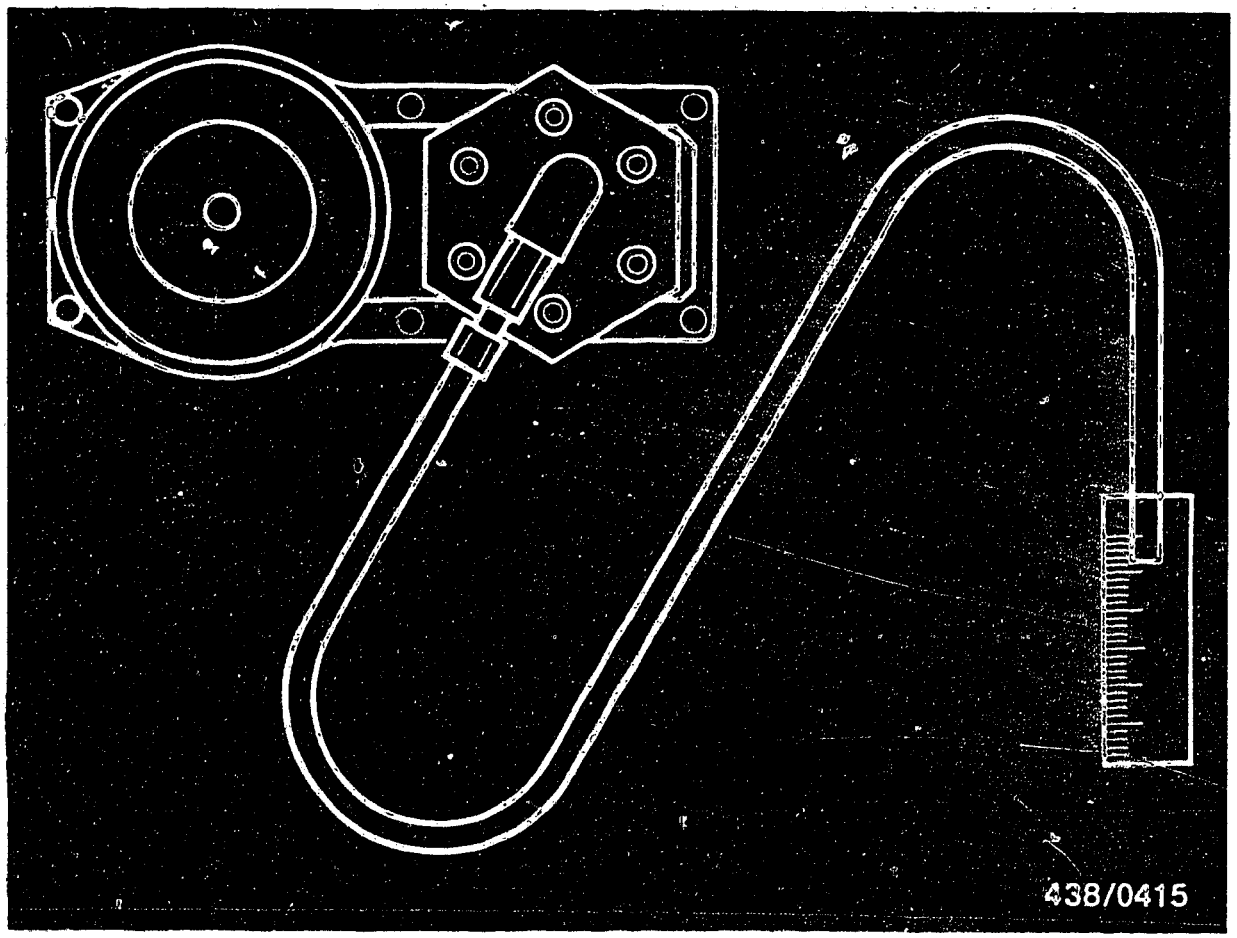
The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
Nominal value = 160...240 cm^3/min.
Reference is made to the other possible causes of trouble in the respective test step.



1 = Fuel inlet
2 = Fuel return
3 = Electric connection
4 = Intake-manifold-pressure connection port (after throttle valve)
5 = Atmospheric pressure connection (connection between air-flow sensor and throttle valve)

14. 2 Version of warm-up regulator:

The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment.
This means that the control pressure is additionally influenced by the intake-manifold pressure.



14.3 Checking the fuel delivery for the control-pressure circuit:

Before testing, make sure that the electric fuel pump is operating properly (fuel delivery: min. 1050 cm^3/30 s).

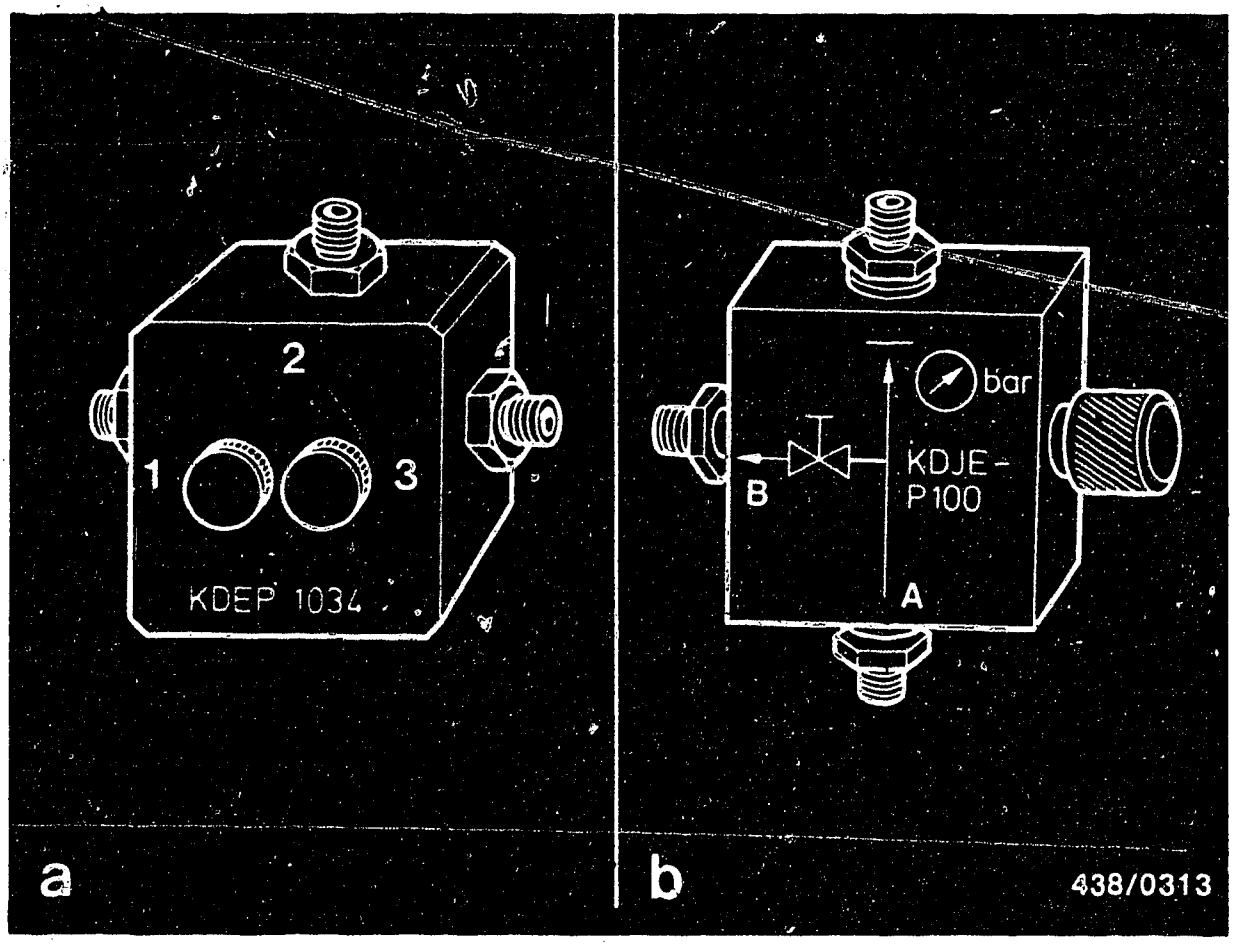
Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor and screw connecting piece (thread M 8x1/M 12x1.5) from connecting parts set KDJE-P 100/10 onto control-pressure port.

Connect one of the two connecting hoses of the pressure tester KDJE-P 100 (previously KDEP 1034) to the control-pressure port of the fuel distributor (thread M 12x1.5) and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

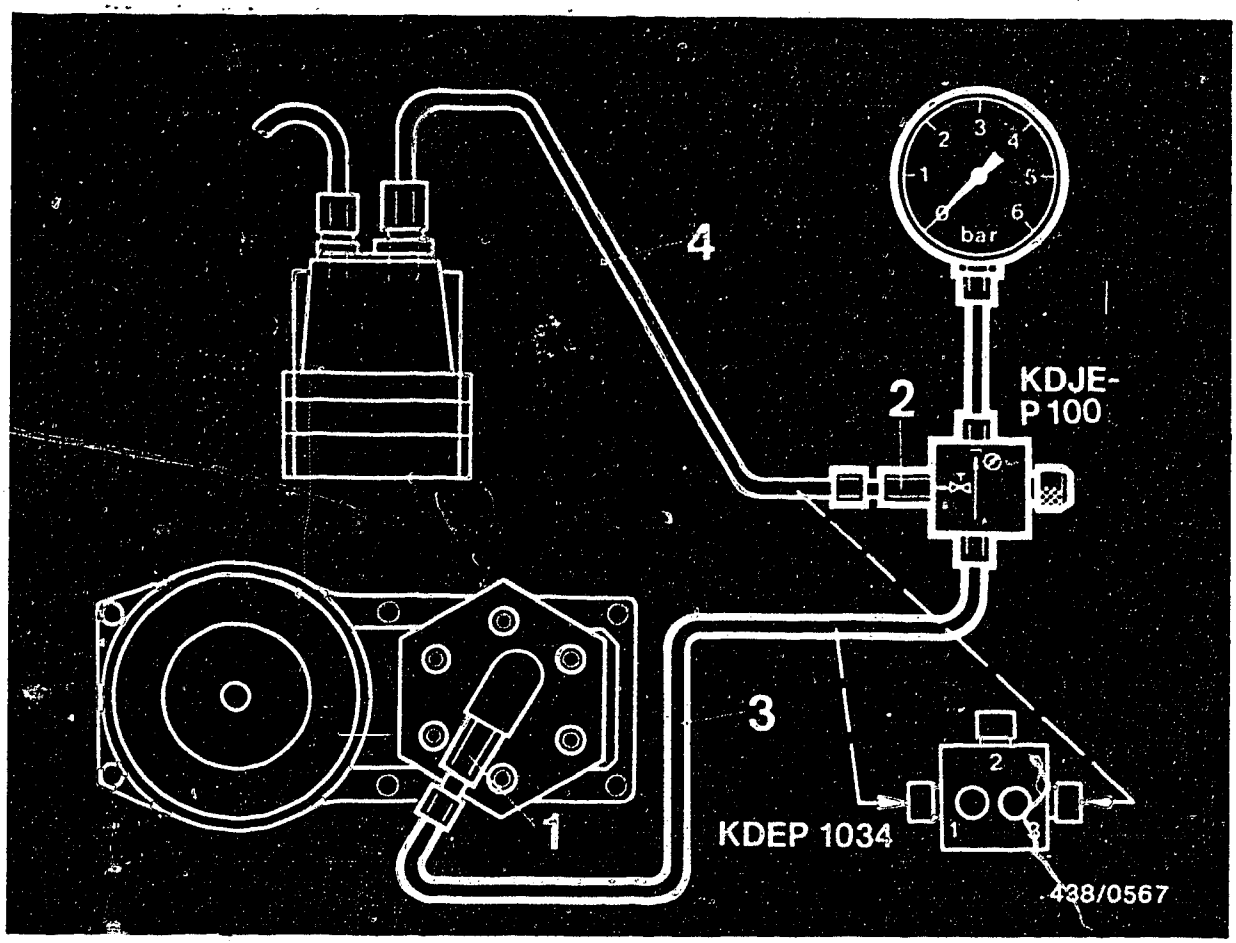
If the measured value is outside tolerance, the fault is in the fuel distributor. Replace the fuel distributor.



14.4 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



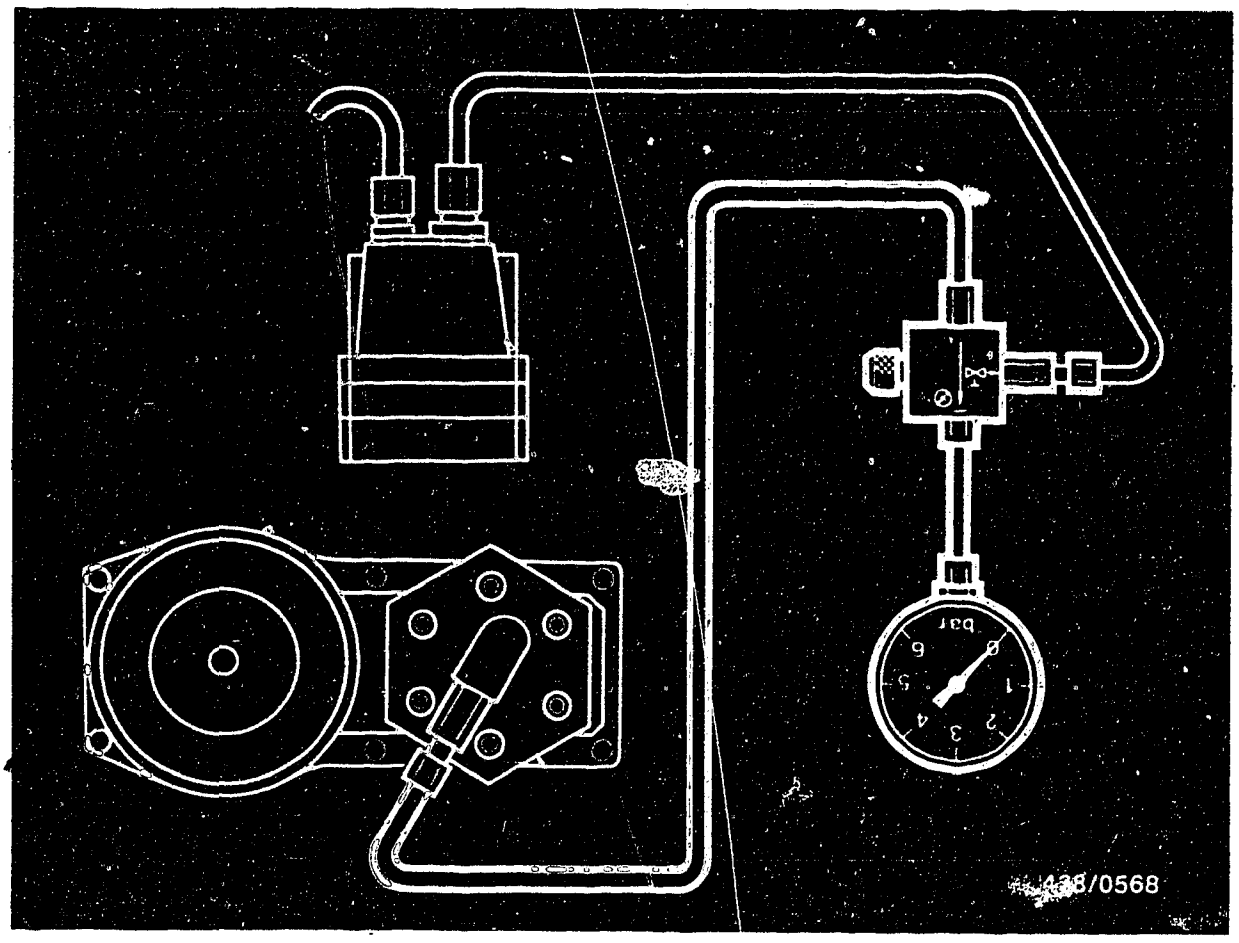
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

The connecting-parts set KDJE-P 100/10 is required.

Screw the adapter of connecting-parts set with seal ring onto connection port B or 3 of the directional-control valve (2).

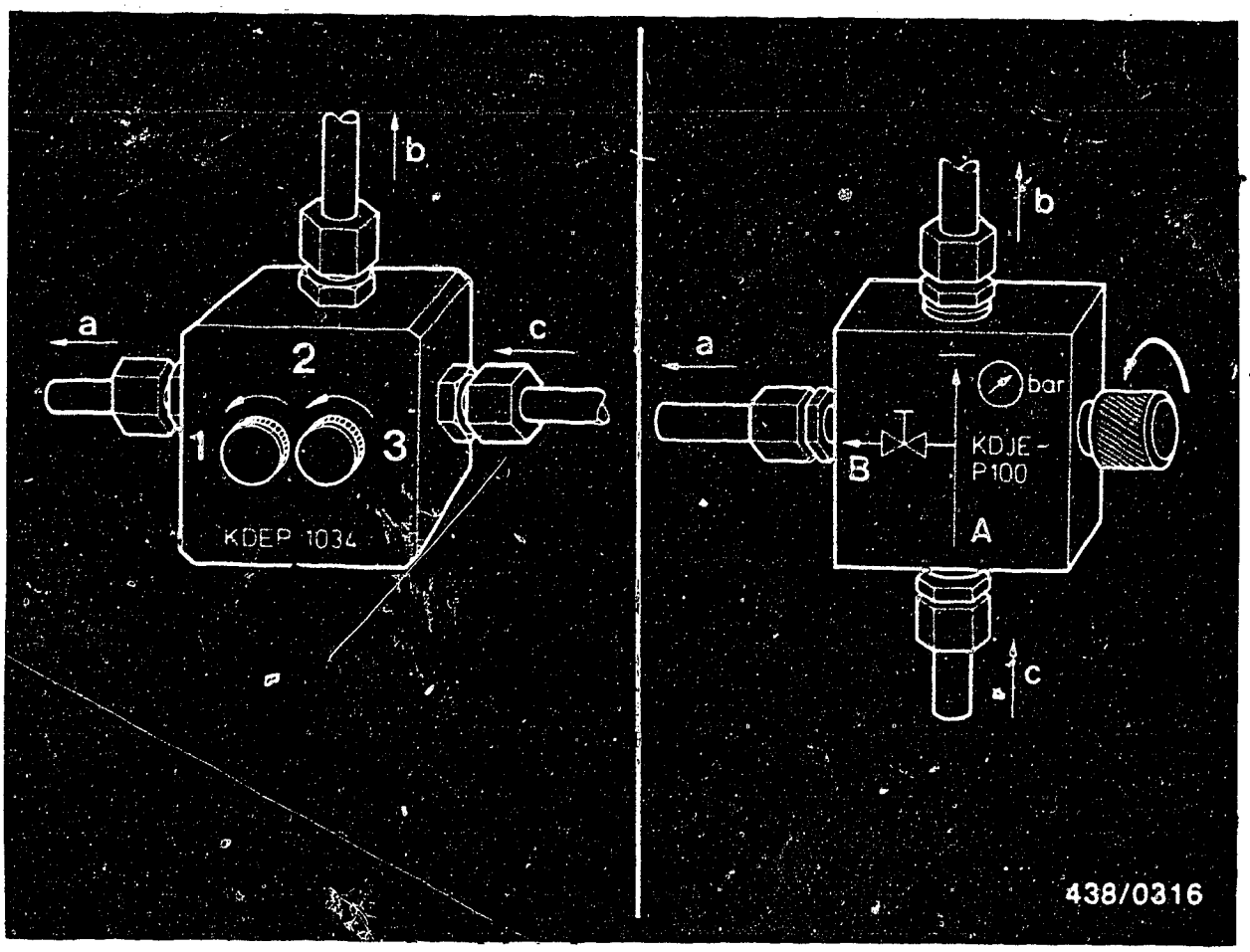
Unscrew control-pressure line (to the warm-up regulator) from the fuel distributor and connect it to the adapter (4).

Screw the connecting piece of the connecting-parts set to the control-pressure connection port of the fuel distributor (1) and connect it with connection port A or 1 of directional-control valve via connecting hose (3).



14.5 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).
Switch on the electric fuel pump by bridging the electrical safety circuit:
Open and close the valve screw of the directional-control valve (valve screw 3 in the case of KDEP 1034) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

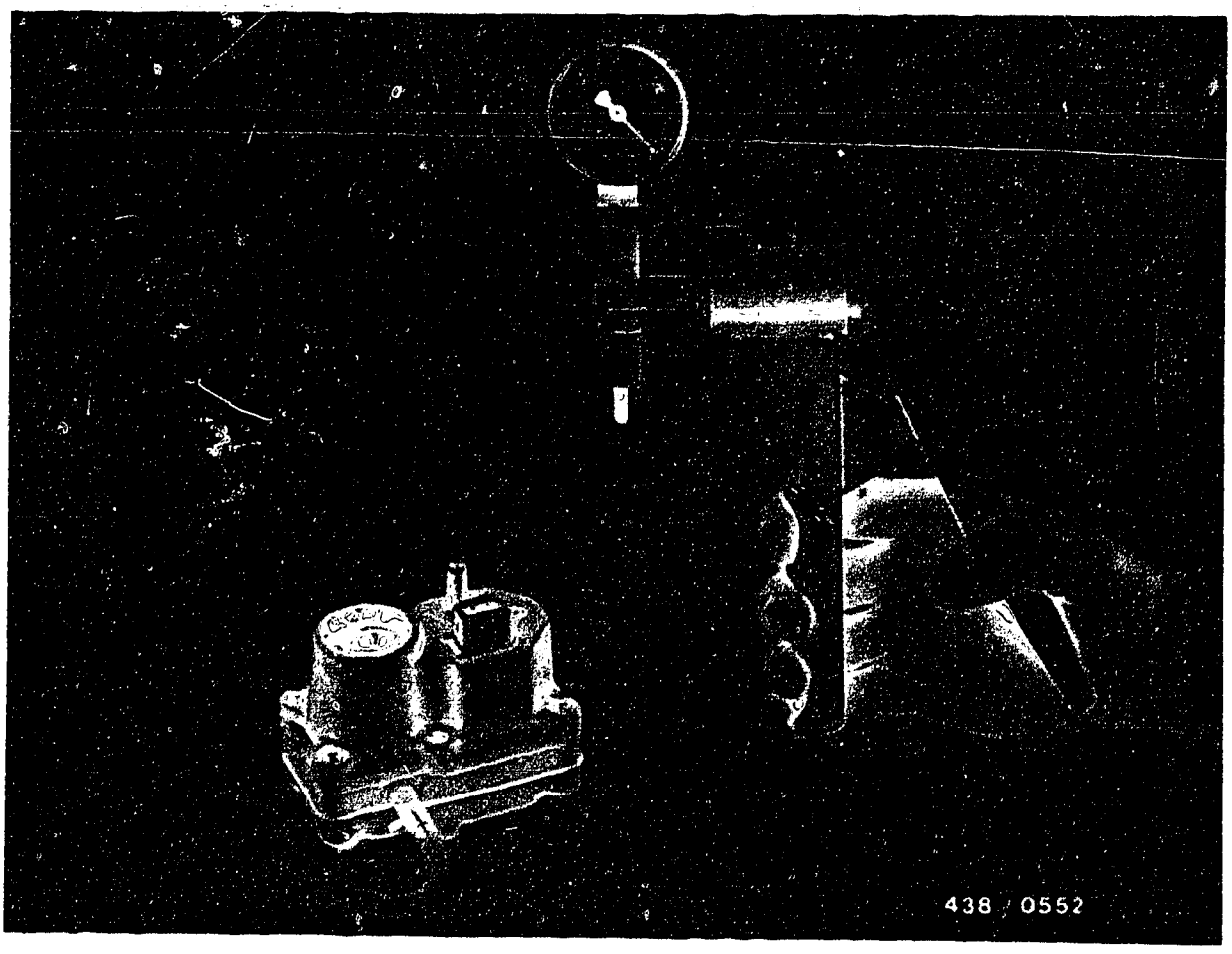


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.6 Testing the "cold" control pressure:

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

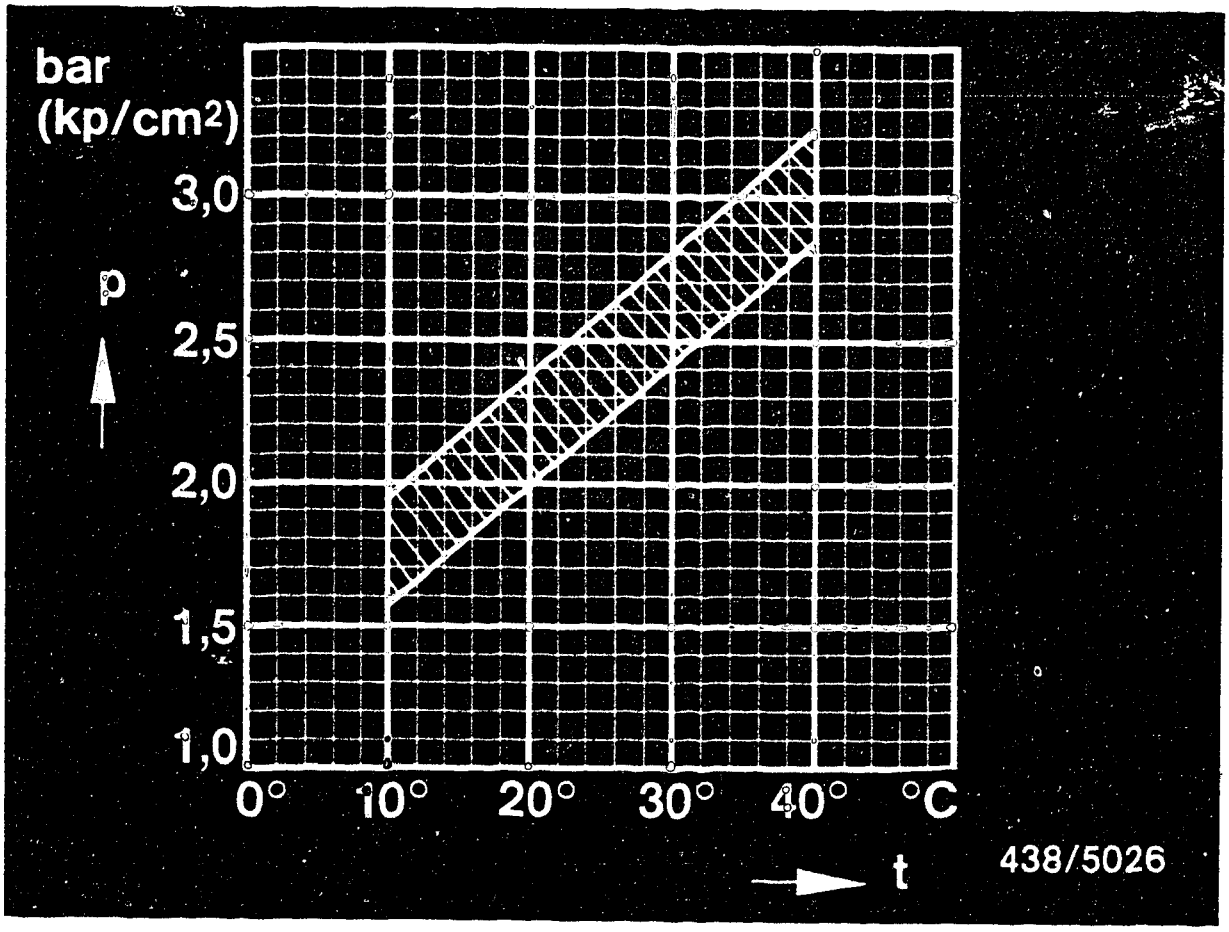


The control pressure is checked with simulated intake-manifold pressure i.e. vacuum is applied to the warm-up regulator.

To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the intermediate plate of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 465...600 mbar
(350...450 mmHg)

Switch on the electric fuel pump by bridging the safety circuit.
The "cold" control pressure is now indicated on the pressure gauge.



p = Control pressure
t = Ambient temperature

Warm-up regulator 0 438 140 045
Calculate the nominal control pressure in accordanc
with the ambient temperatures in the graph.

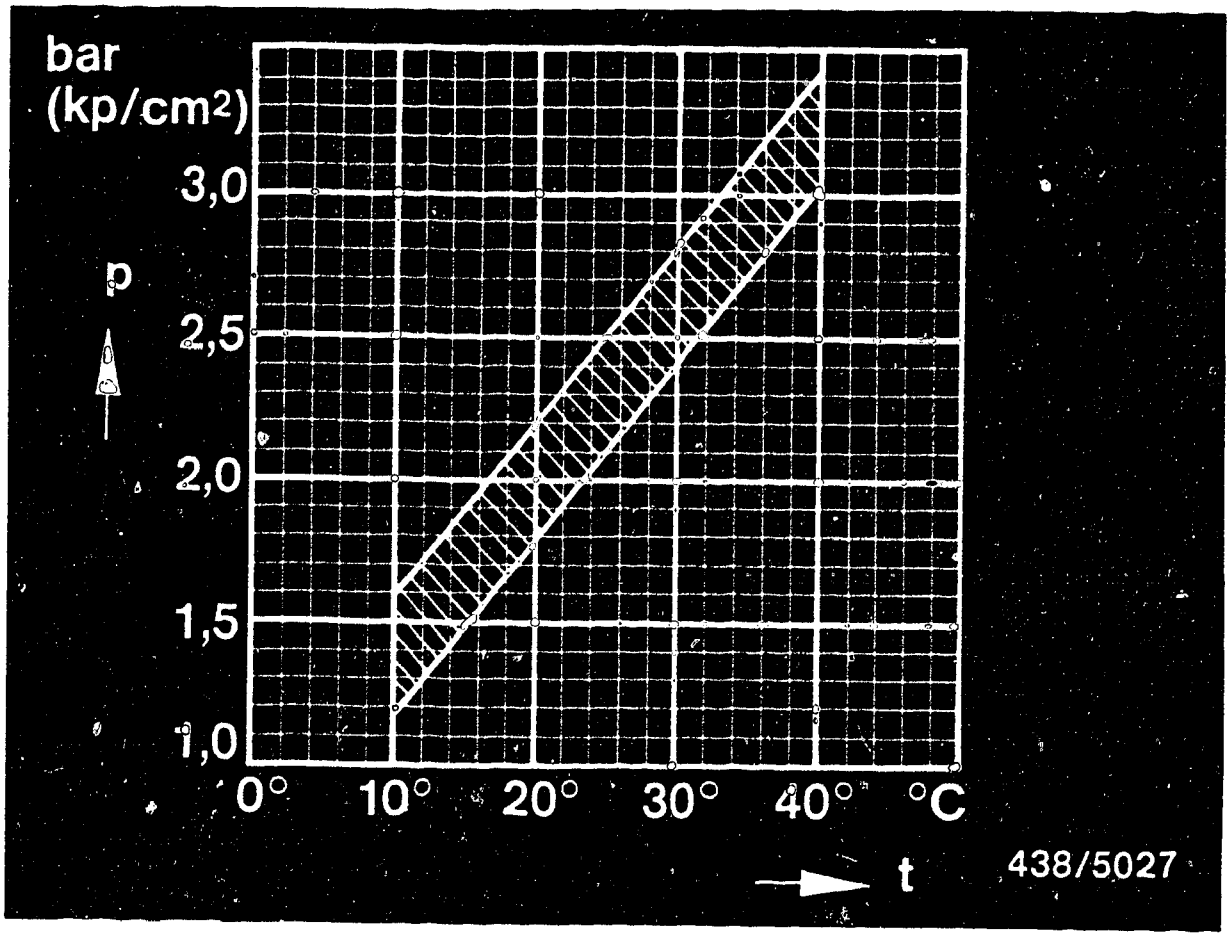
Example: Ambient temperature = 15°C
Nominal control pressure = 1.8...2.2 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, it may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.
  Nominal value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or restricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.



p = Control pressure
t = Ambient temperature

Warm-up regulator Part No.: 0 438 140 069
Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

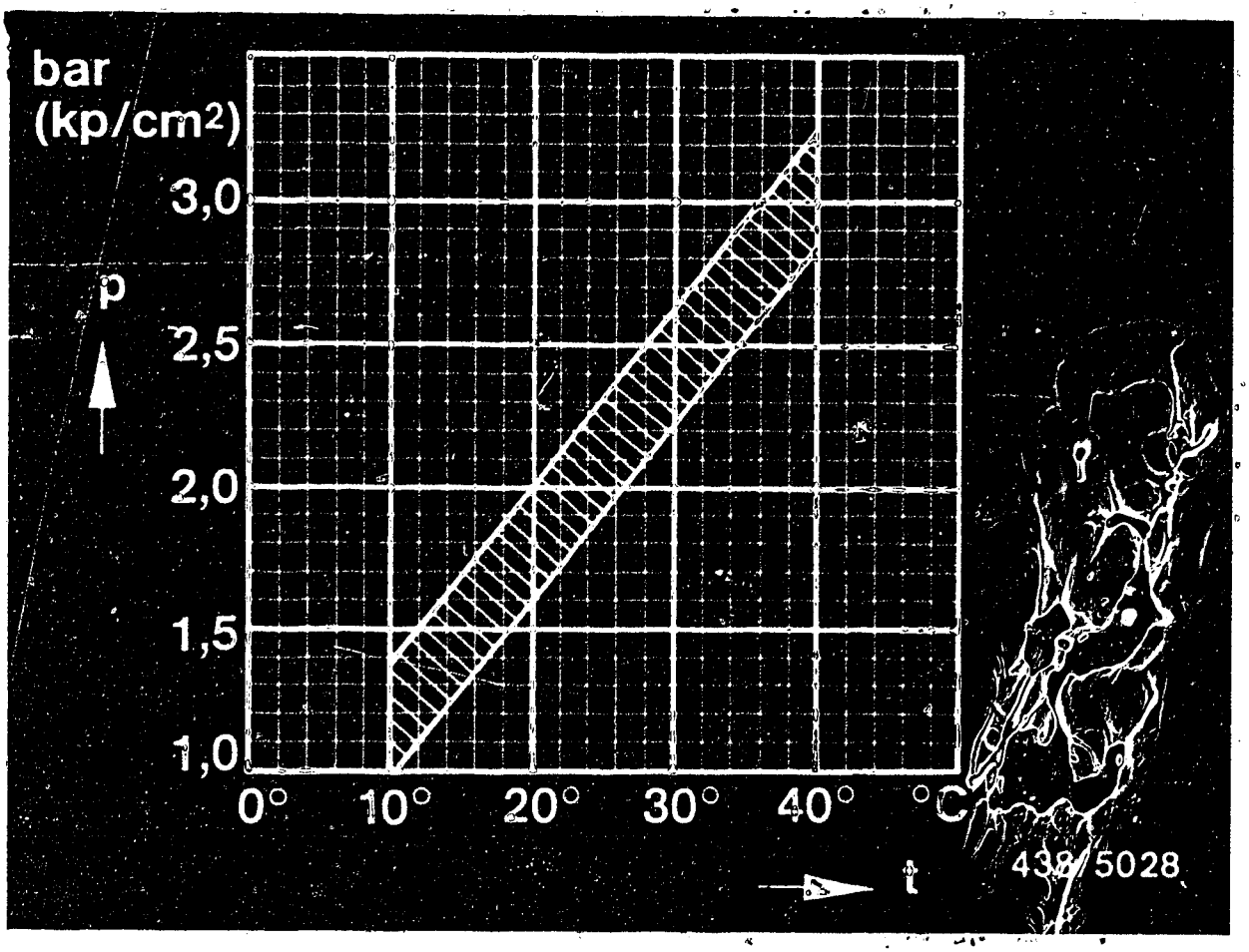
Example: Ambient temperature = 20°C
Nominal control pressure = 1.8...2:2 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, it may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.
  Nominal value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or restricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.



p = Control pressure
t = Ambient temperature

Warm-up regulator Part No.: 0 438 140 089
Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

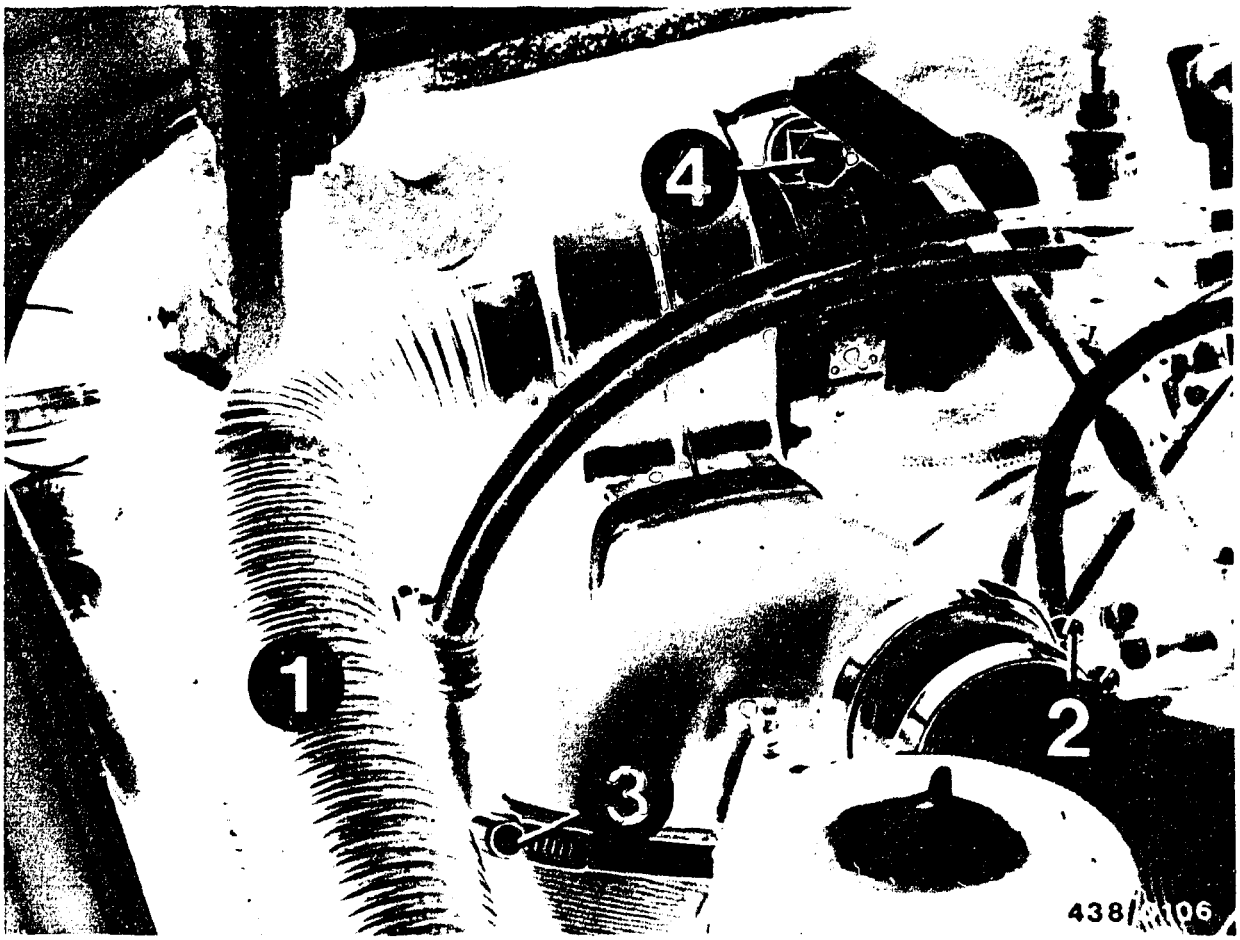
Example: Ambient temperature = 20°C
Nominal control pressure = 1.7...2.1 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, it may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.
  Nominal value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or restricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.



Removing and installing the warm-up regulator:

Before removing, dismantle the auxiliary-blower system as follows.

Remove intake hose 1 of the auxiliary blower.

Loosen the two hose clips 2 and 3 and remove the air hoses from the air distributor of the auxiliary blower.

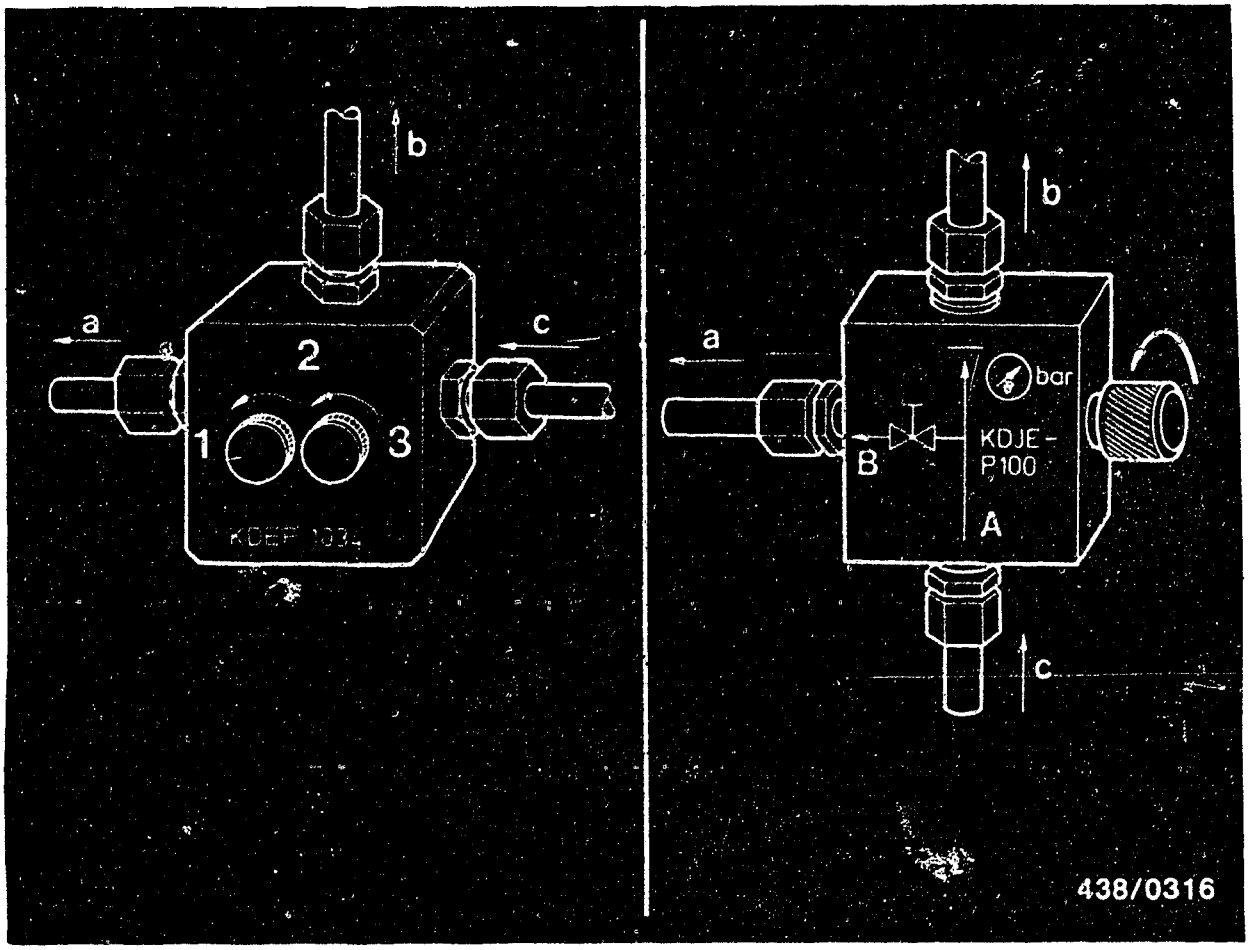
Note:

On the 911 SC model the two air hoses are each additionally held in position by a plastic rivet which must likewise be removed.

To do this, remove the hose clamps entirely.

Loosen clamping screw 4 of the blower motor and turn the motor with the air distributor upwards.

Replace the warm-up regulator and re-install the auxiliary-blower system in the reverse order.

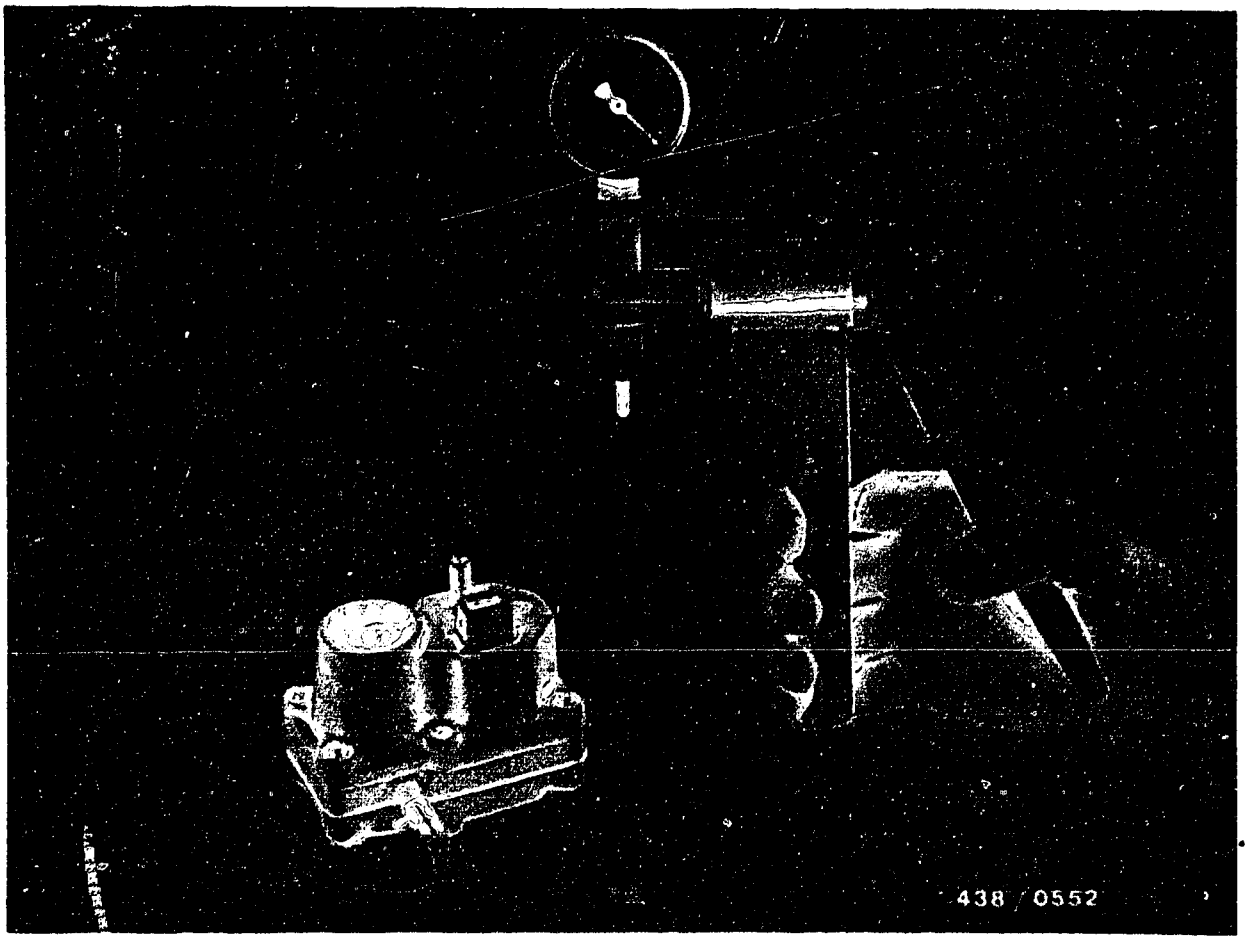


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Checking the "warm" control pressure

Warm-up regulator Part No.: 0 438 140 045
0 438 140 069
0 438 140 089

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.



For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (in the intermediate plate of the housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 465...600 mbar
(350...450 mmHg)

Test procedure:

The temperature of the engine is not important.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.
Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

The test is performed first without intake-manifold pressure being applied, then with simulated intake-manifold pressure (vacuum) applied in accordance with test specifications on the following coordinates:

Test step	Test specifications*
"Warm" control pressure Part No. of warm-up regulator: 0 438 140 045 0 438 140 069	
• Test with atmospheric pressure (without vacuum)	2.7...3.1 bar (2.8...3.2 kgf/cm²)
• For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator Setting value: 465...600 mbar (350...450 mmHg)	3.2...3.6 bar (3.3...3.7 kgf/cm²)
"Warm" control pressure Part No. of warm-up regulator: 0 438 140 089	
• Test with atmospheric pressure (without vacuum)	2.7...3.1 bar (2.8...3.2 kgf/cm²)
• For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator Setting value: 465...600 mbar (350...450 mmHg)	3.4...3.8 bar (3.5...3.9 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm² (gauge pressure).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
  Test fuel delivery.
  Nominal value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted.
  Eliminate constriction.

- Warm-up regulator has hydraulic defect.
  Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.
  Eliminate open circuit. Ensure that the plug is contacking properly.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

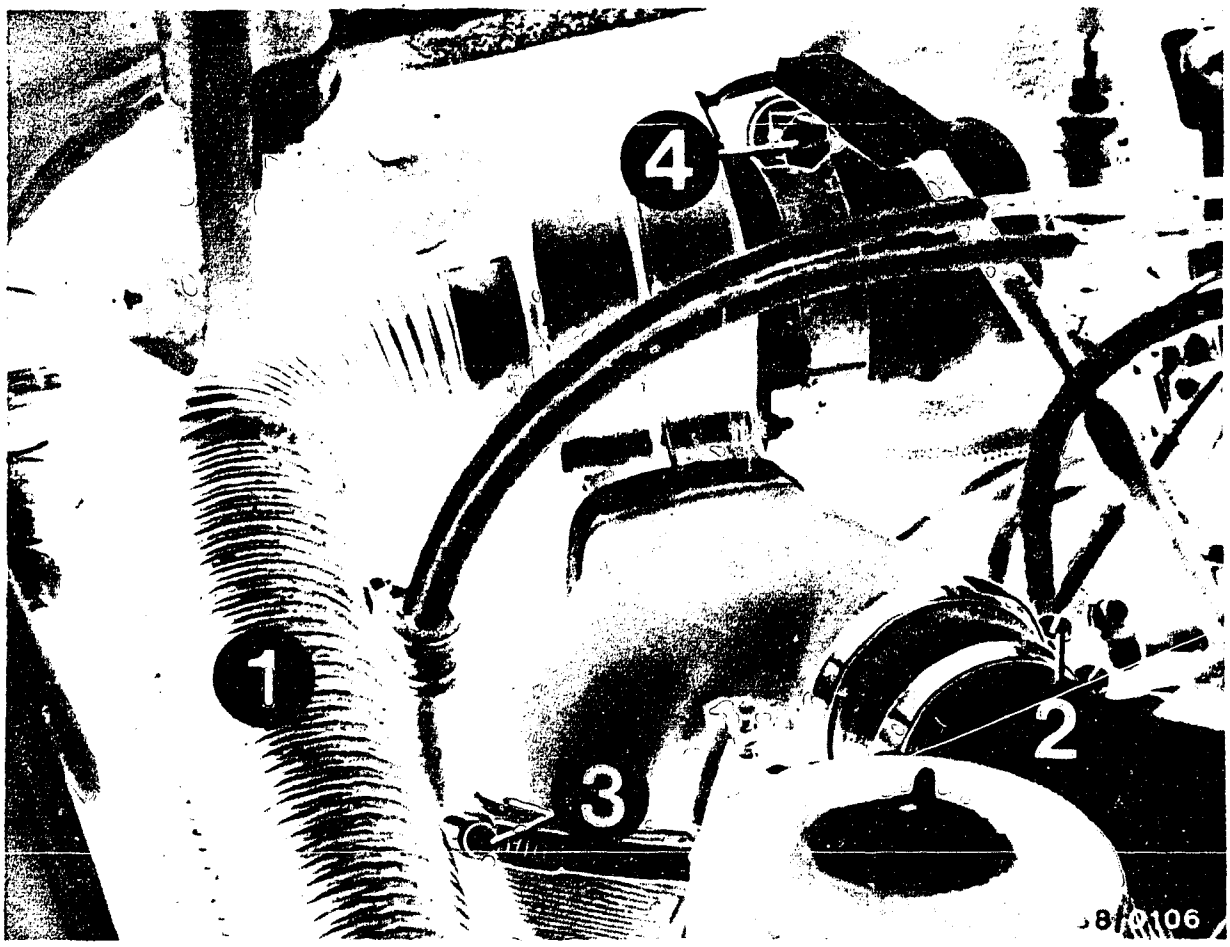
- Fuel delivery for the control-pressure circuit too low.
  Test fuel delivery.
  Nominal value: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit
  Hydraulic defect

Replace warm-up regulator.

If the warm-up regulator has been replaced or a defect has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 20.



Removing and installing the warm-up regulator:

Before removing, dismantle the auxiliary-blower system as follows.

Remove intake hose 1 of the auxiliary blower.

Loosen the two hose clips 2 and 3 and remove the air hoses from the air distributor of the auxiliary blower.

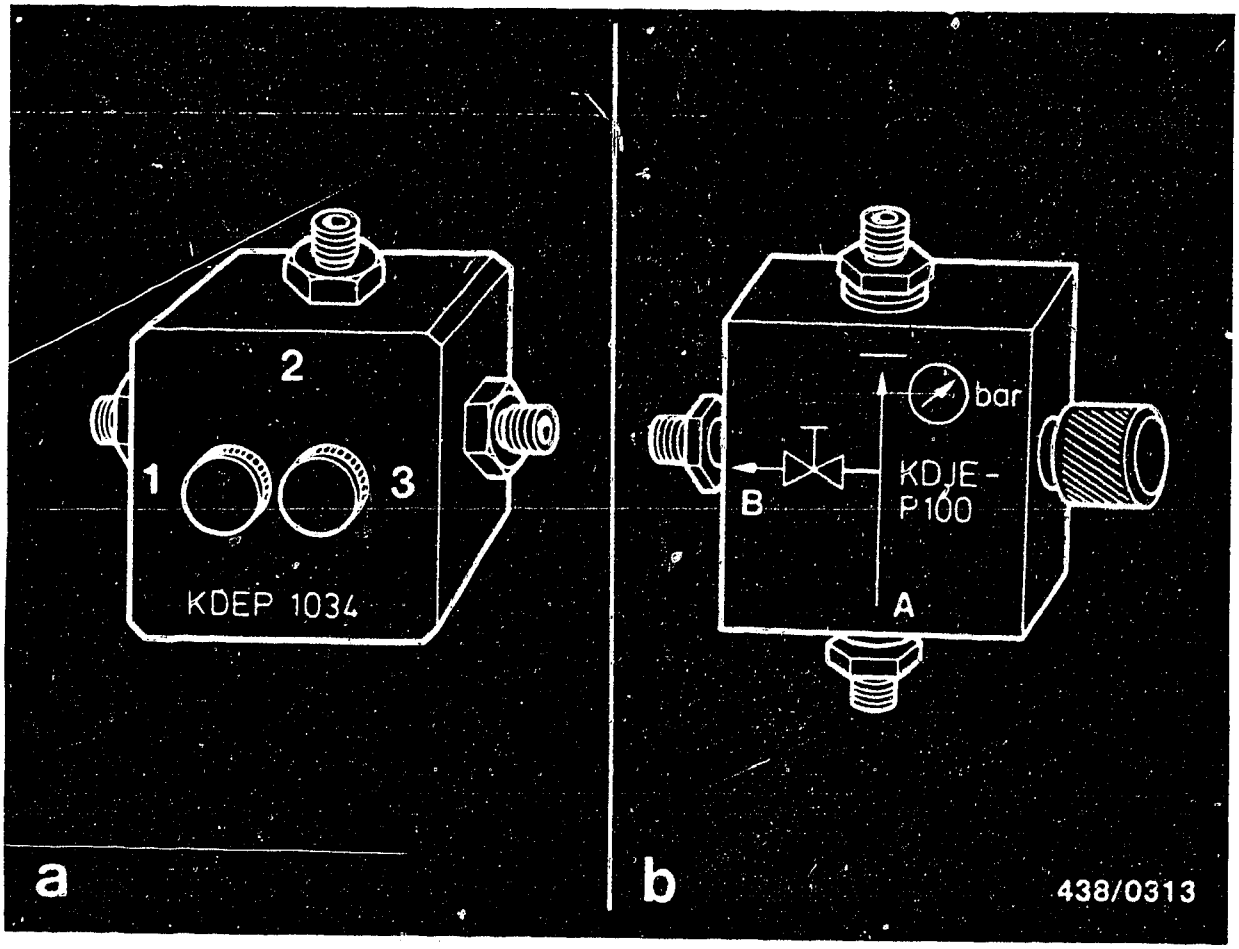
Note:

On the 911 SC model the two air hoses are each additionally held in position by a plastic rivet which must likewise be removed.

To do this, remove the hose clamps entirely.

Loosen clamping screw 4 of the blower motor and turn the motor with the air distributor upwards.

Replace the warm-up regulator and re-install the auxiliary-blower system in the reverse order.

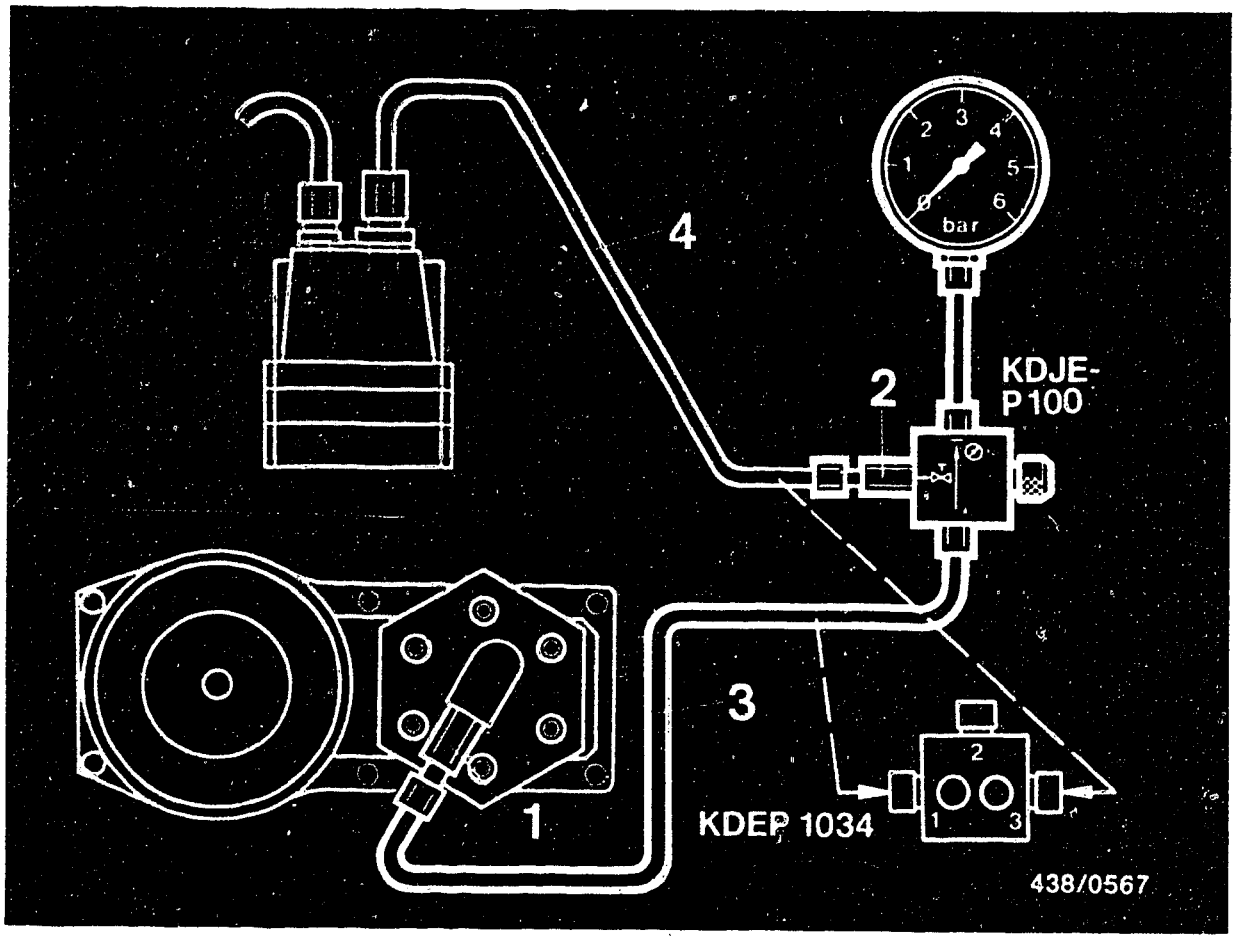


15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



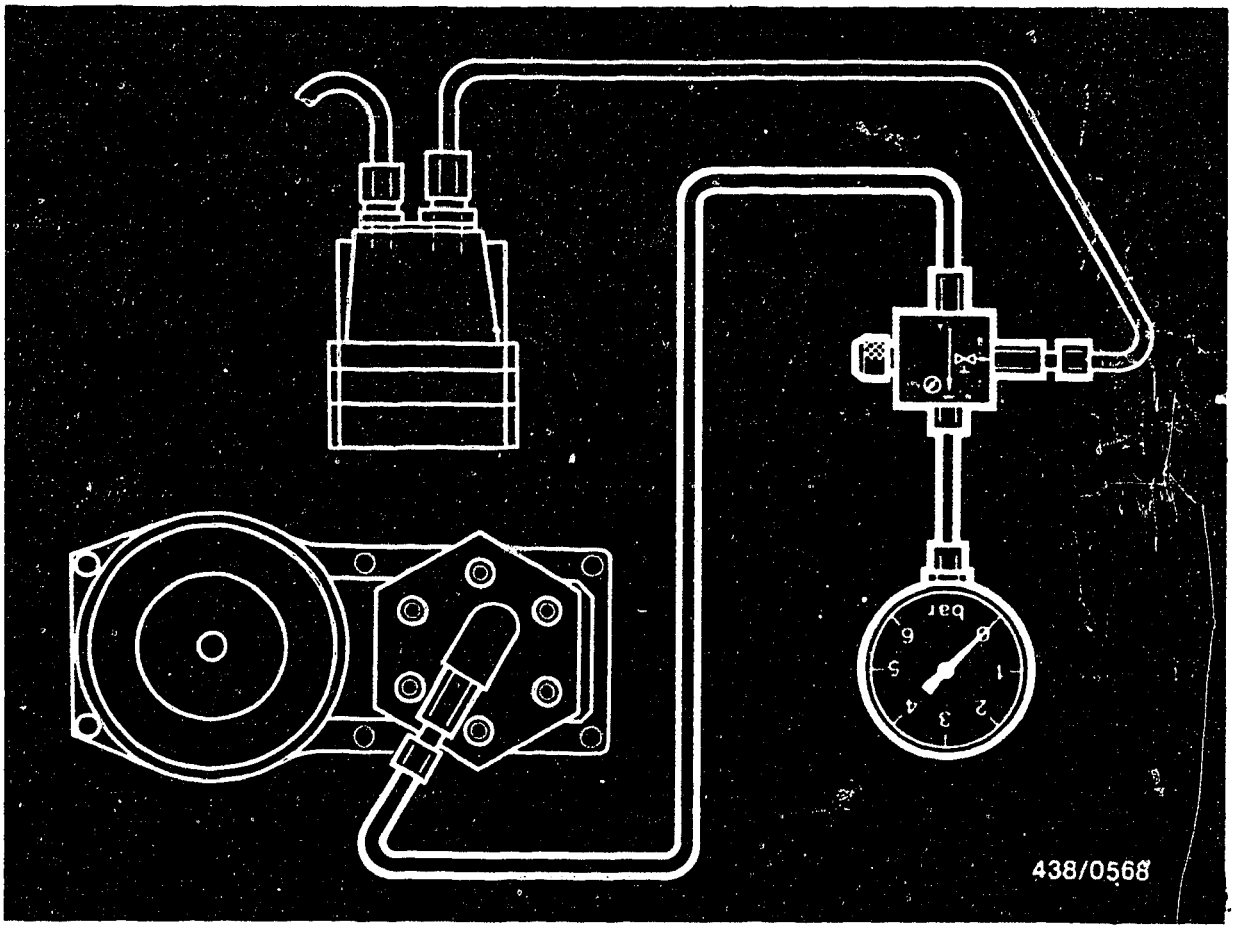
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

The connecting-parts set KDJE-P 100/10 is additionally required.

Screw the adapter of the connecting-parts set with seal ring to connection port B or 3 of the directional-control valve (2).

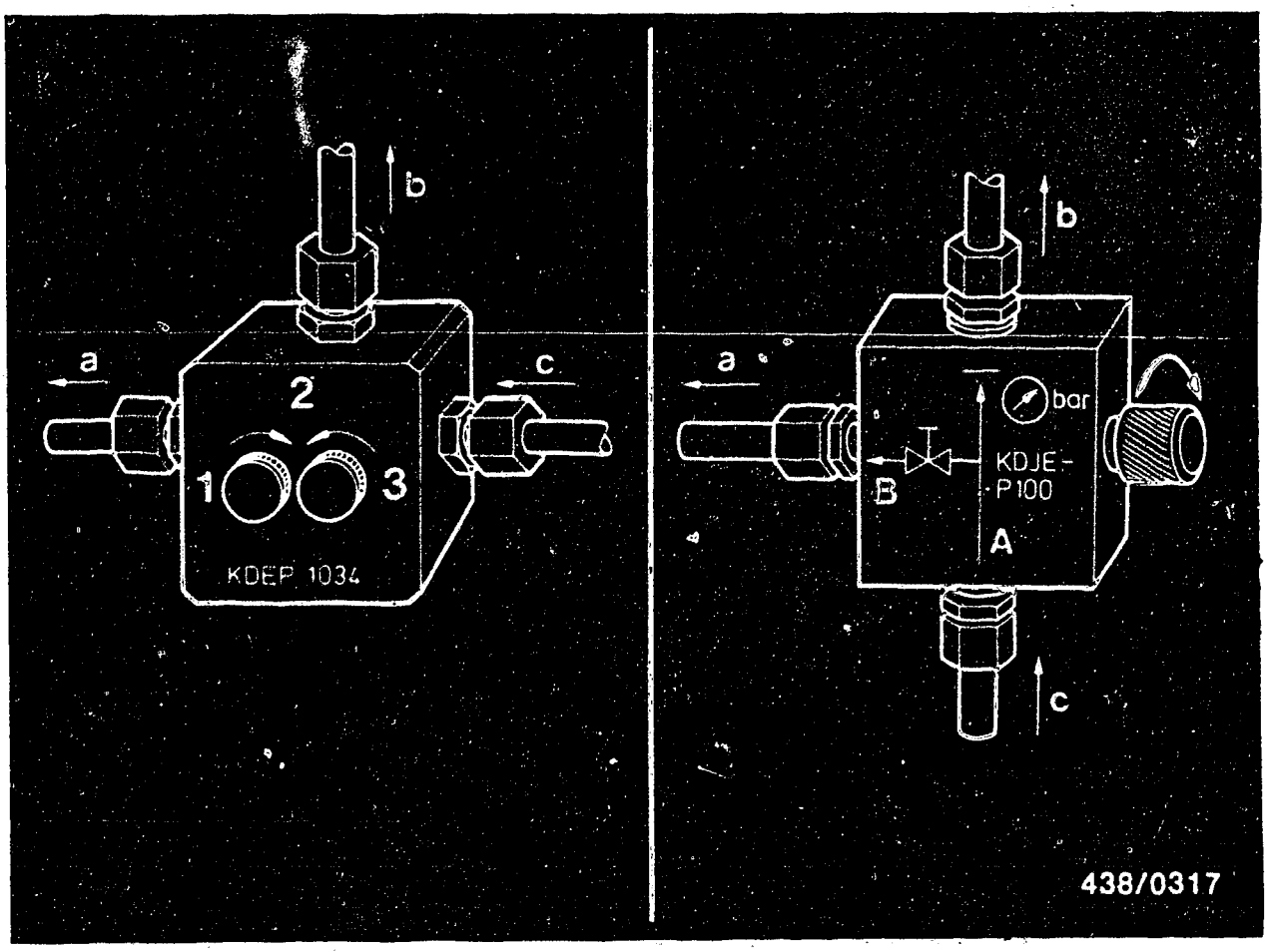
Unscrew the control-pressure line (to warm-up regulator) from the fuel distributor and connect to the adapter (4).

Screw connecting-piece of the connecting-parts set onto control-pressure connection port of the fuel distributor (1) and connect with connection port A or 1 of the directional-control valve via connecting hose (3).



15.2 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).
Switch on the electrical fuel pump by bridging the electrical safety circuit.
Open and close the valve screw of the directional-control valve (valve screw 3 in the case of KDEP 1034) in a 10-second rhythm about 5 times.
Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off.
The temperature of the engine is not important.
Close the valve screw of directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 3, open valve screw 1.
Switch on the electric fuel pump by bridging the electrical safety circuit.
The pressure gauge now indicates the primary pressure.

Primary-pressure test specification:

4.5...5.2 bar (4.6...5.3 kgf/cm²) gauge pressure

Possible causes for too low a primary pressure:

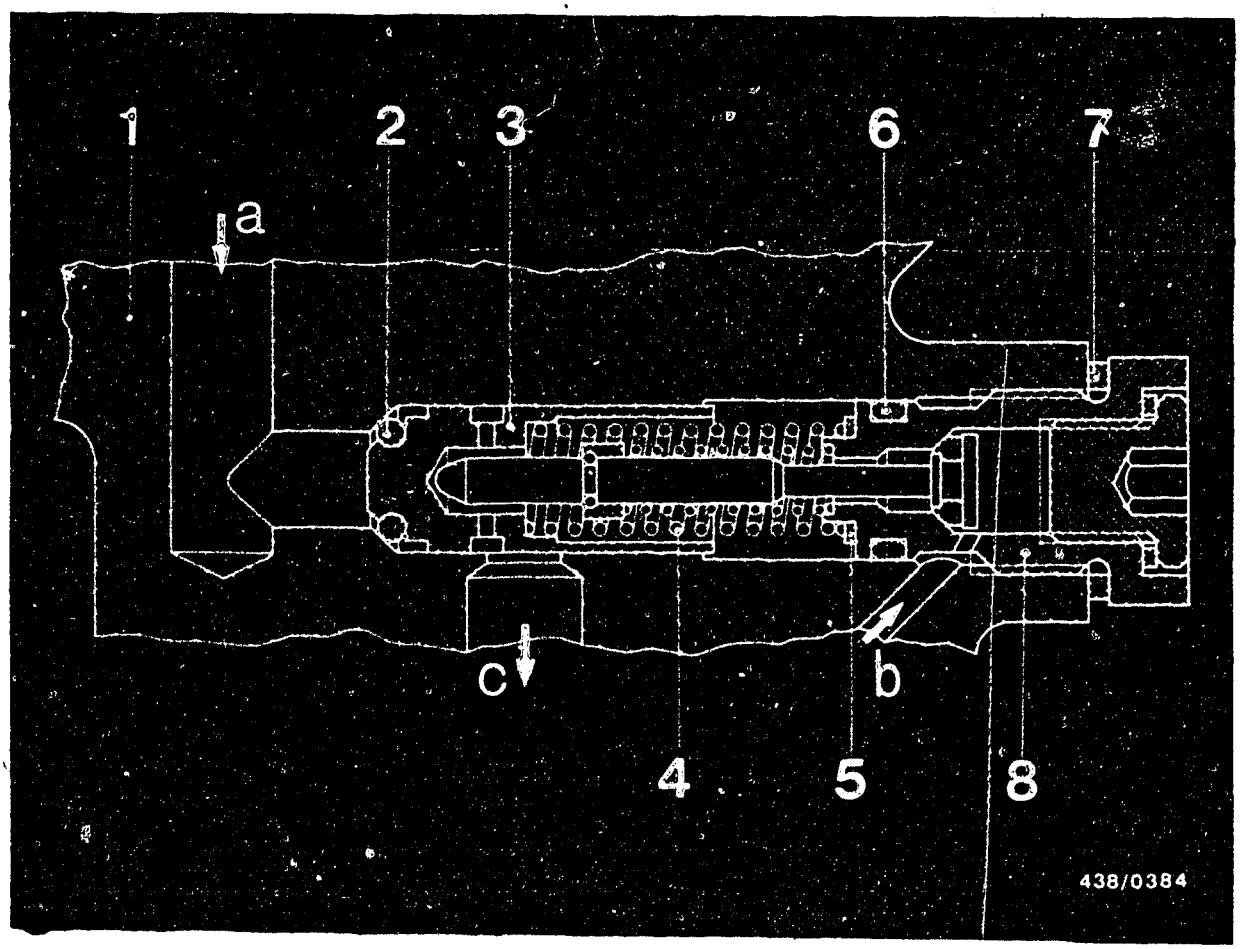
- Fuel supply faulty.
  (Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.
  A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
  Measure the fuel delivery
  Nominal value for fuel delivery = min. 1000 cm³/30 s

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

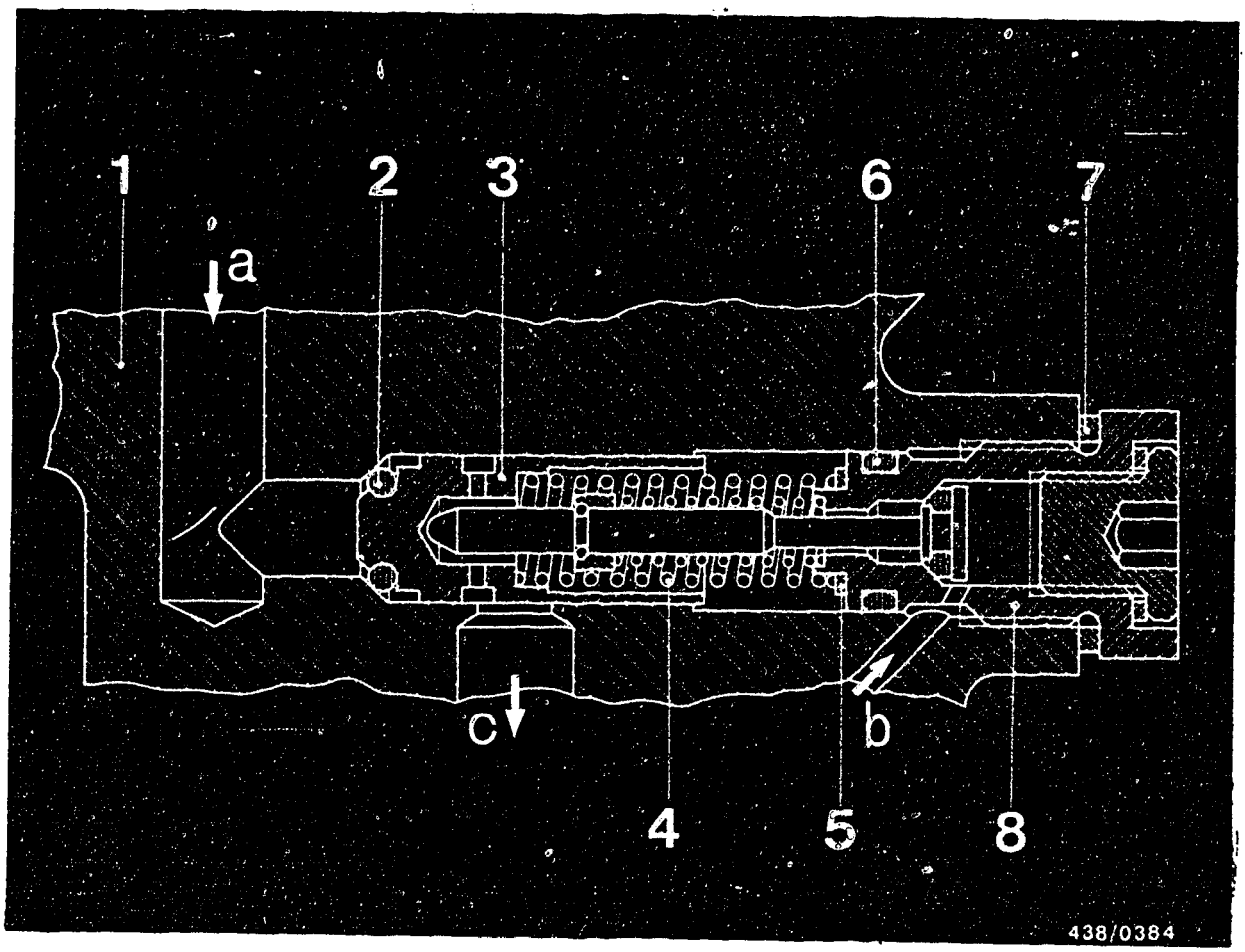
- Primary-pressure regulator set incorrectly.
  For this reason, before readjusting to high a primary pressure, always first check the condition of the return line leading to the fuel tank.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Primary-pressure adjustment value 4.7...4.9 bar
(4.8...5.0 kgf/cm²)

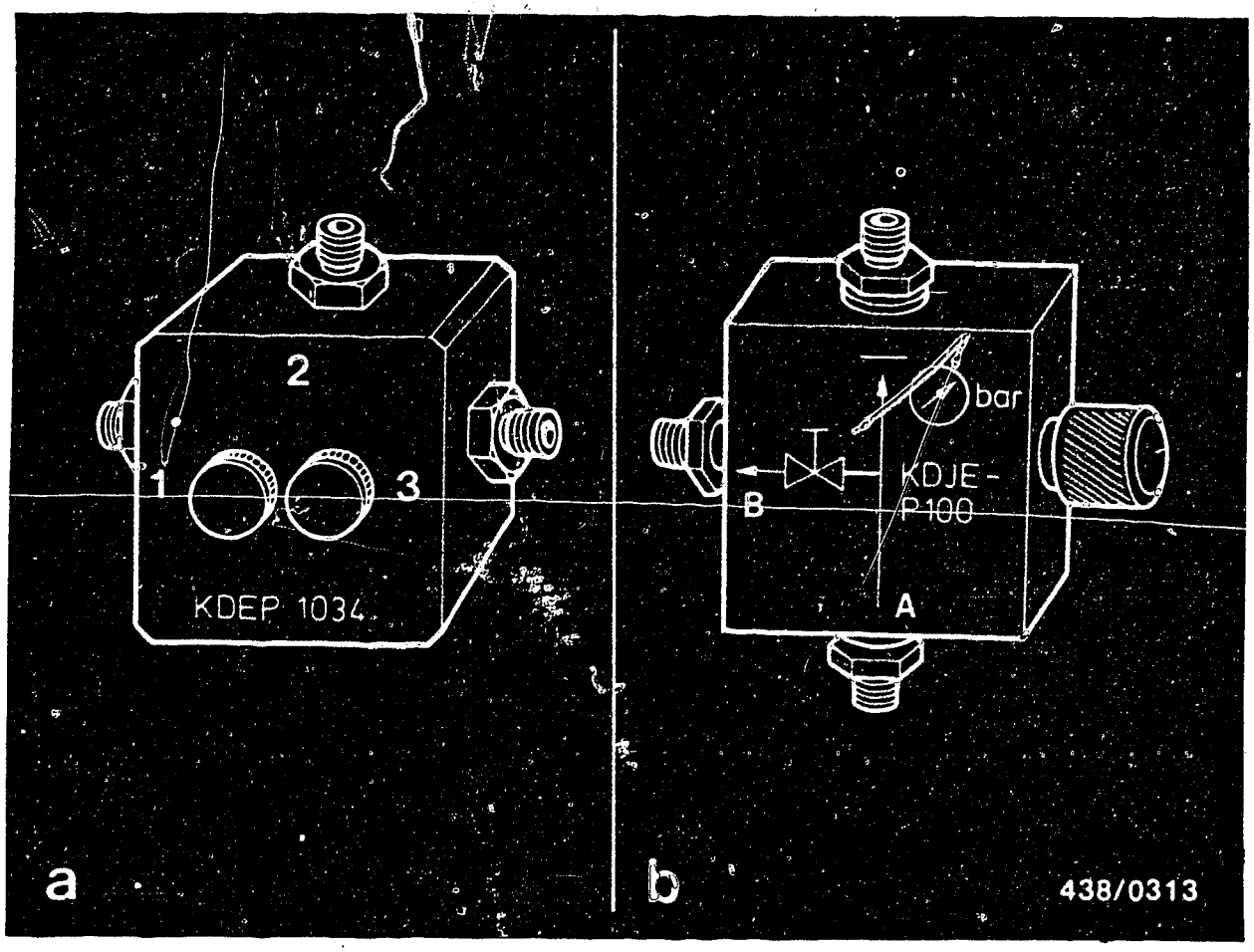


Readjust the primary pressure by replacing the shims (Item 5).

Note: 0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, unscrew the large screw plug (8) together with push valve. After adjustment has been carried out the screw plug should on principle be fitted with a new flat seal ring (7) and O-ring (6).

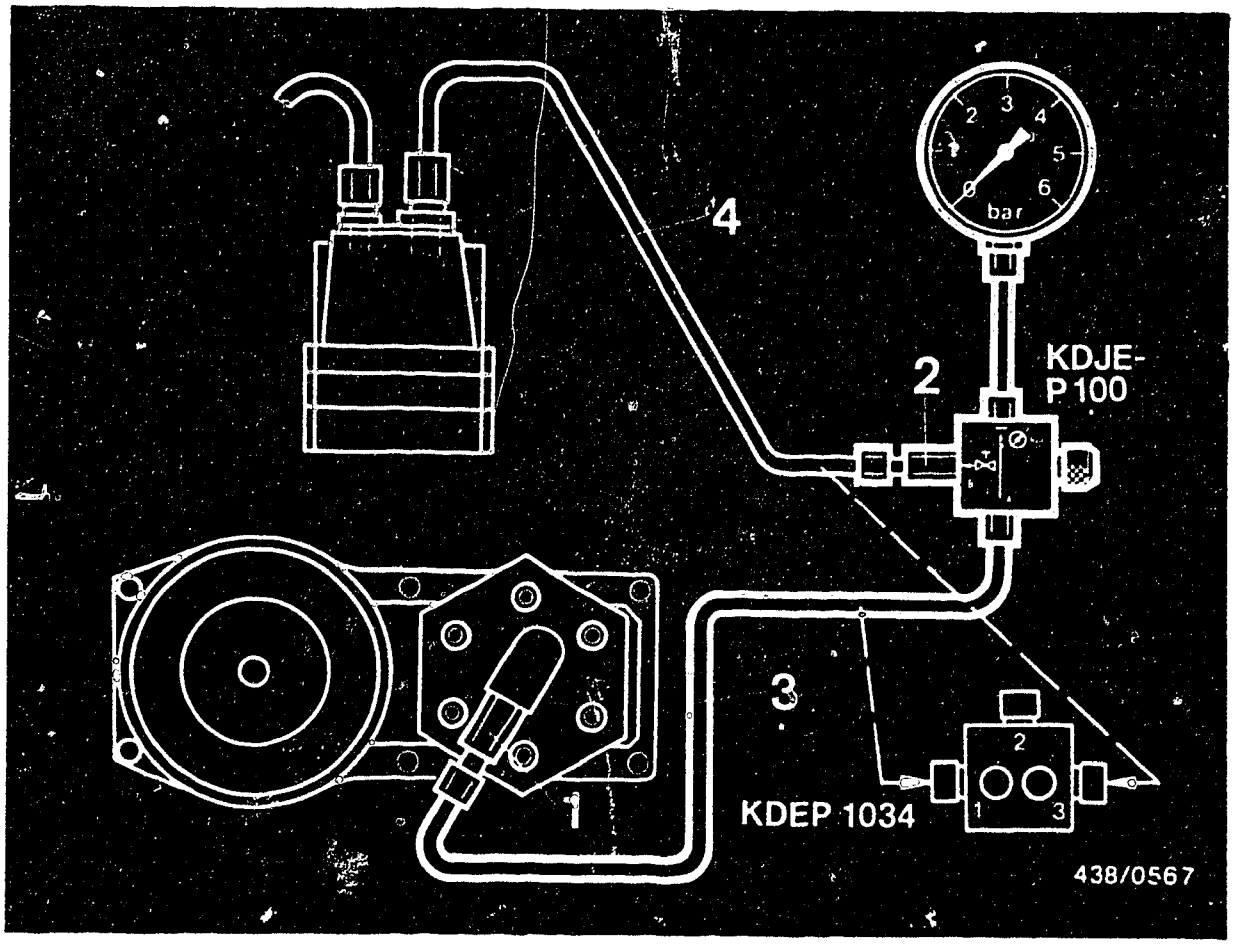
The control piston (3) of the primary-pressure regulator must not be lost. It was fitted in the works in the fuel distributor housing and therefore must not be exchanged as a single part of the primary-pressure regulator.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

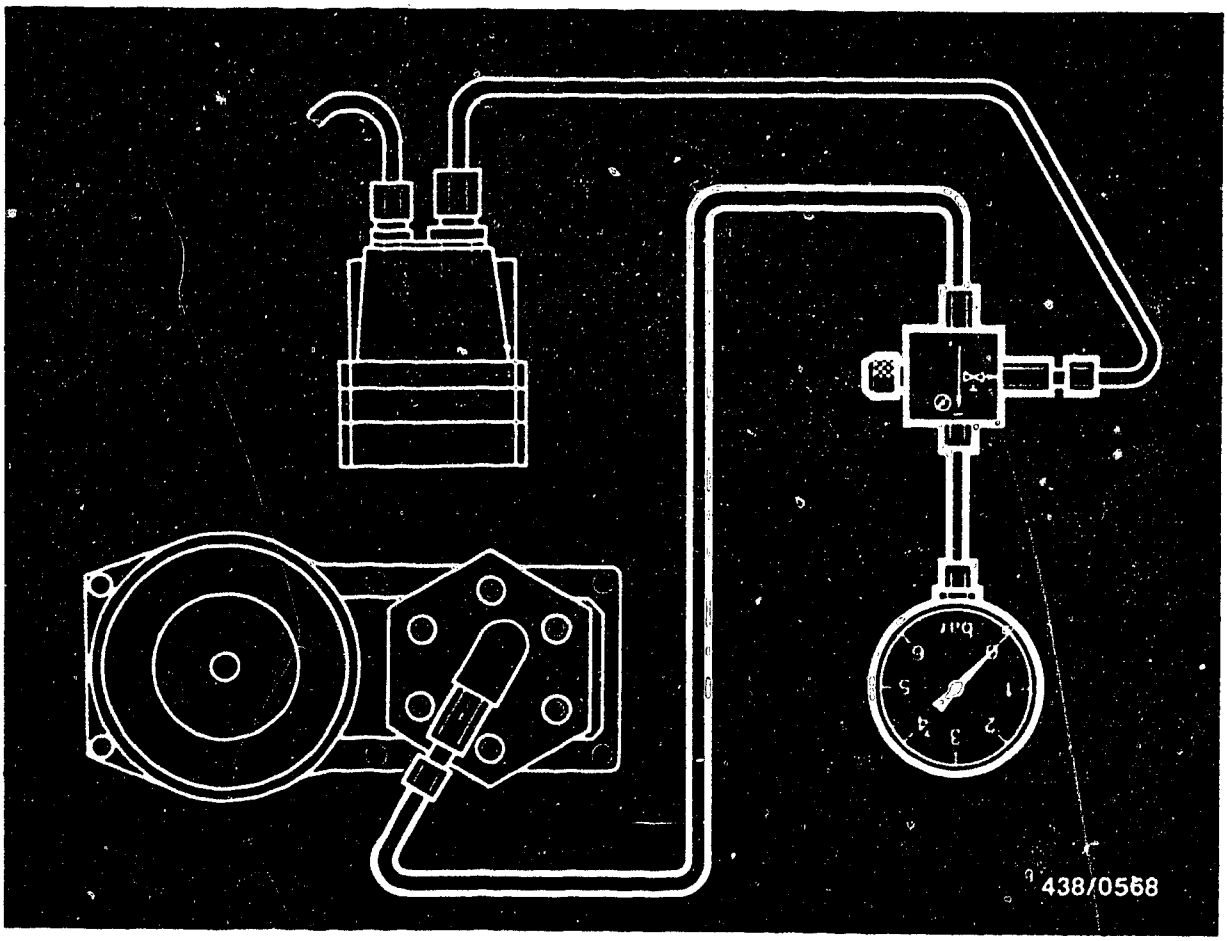
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b).
The connections of this directional-control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)



Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

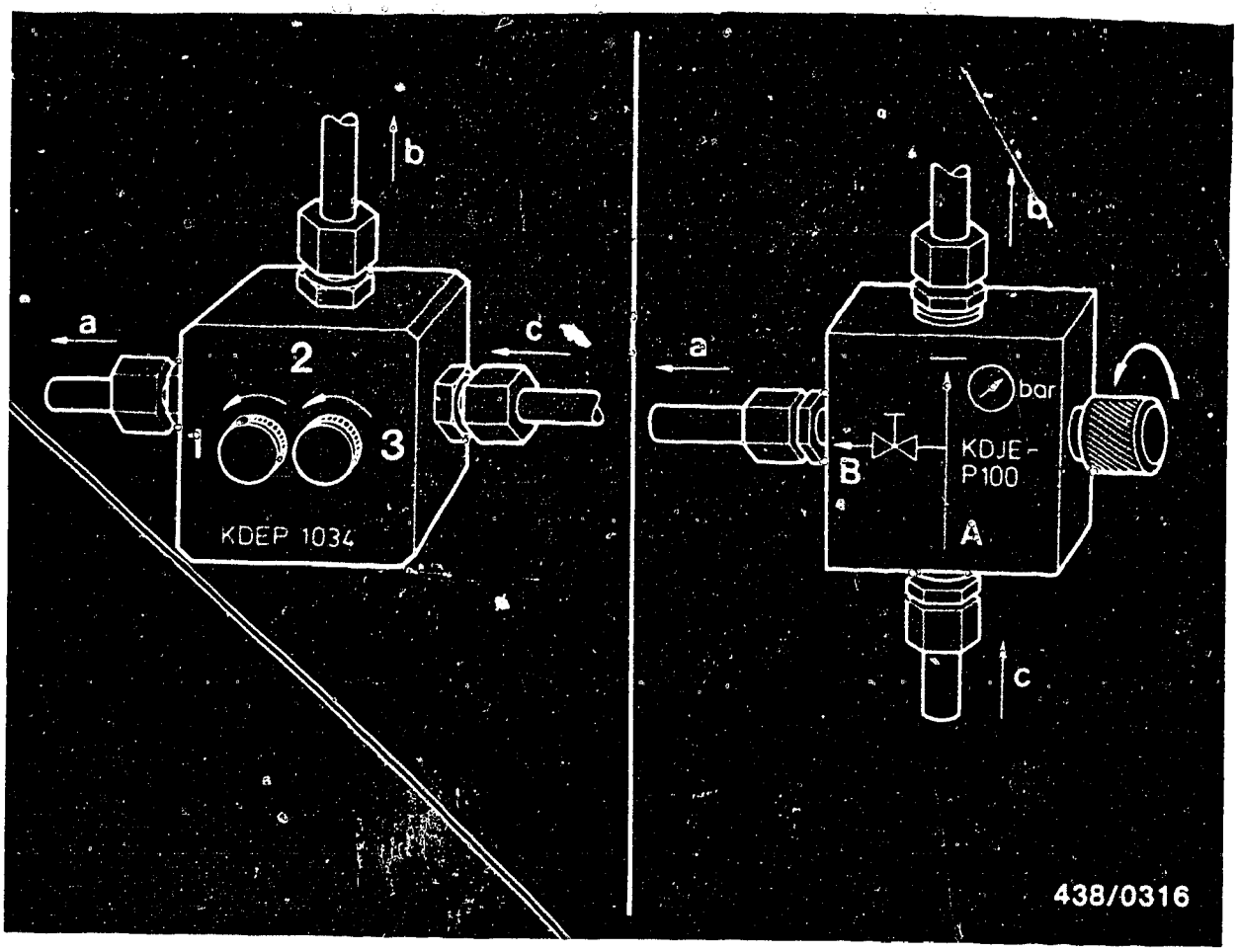
The connecting-parts set KDJE-P 100/10 is additionally required.
Screw the adapter of connecting-parts set with seal ring to connection port B/3 of directional-control valve (2).
Unscrew the control-pressure line (to warm-up regulator) from the fuel distributor and connect to the adapter. (4).

Screw connecting piece of connecting-parts set to control-pressure connection port of the fuel distributor (3) and connect with connection port A/1 of the directional-control valve via connecting hose (3).



16.2 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and the auxiliary-air valve.
Let the pressure gauge hang down (hose fully extended).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Open and close the valve screw of the directional-control valve (valve screw 3 in the case of KDEP 1034) in a 10-second rhythm abcut 5 times.
Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

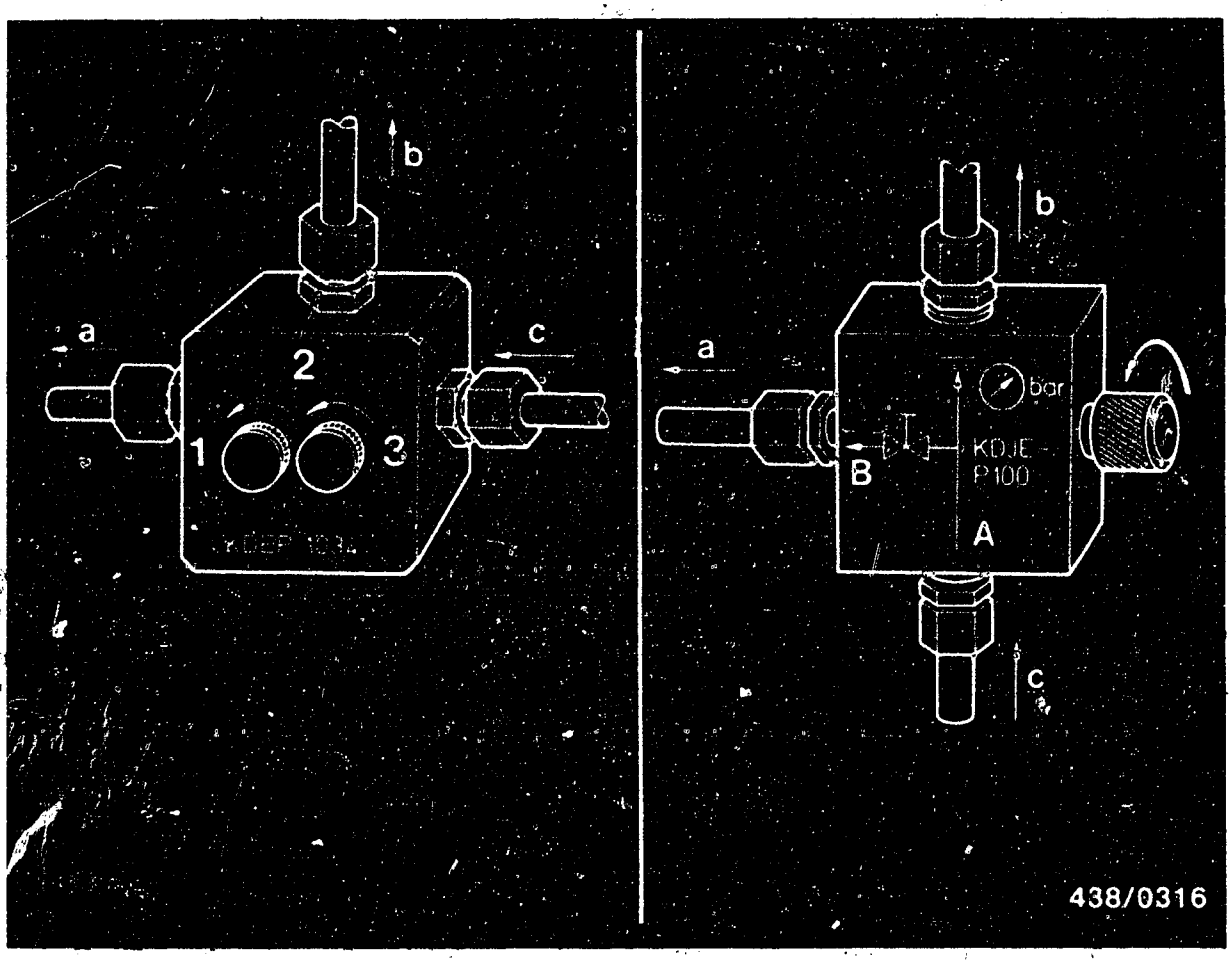


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.

Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

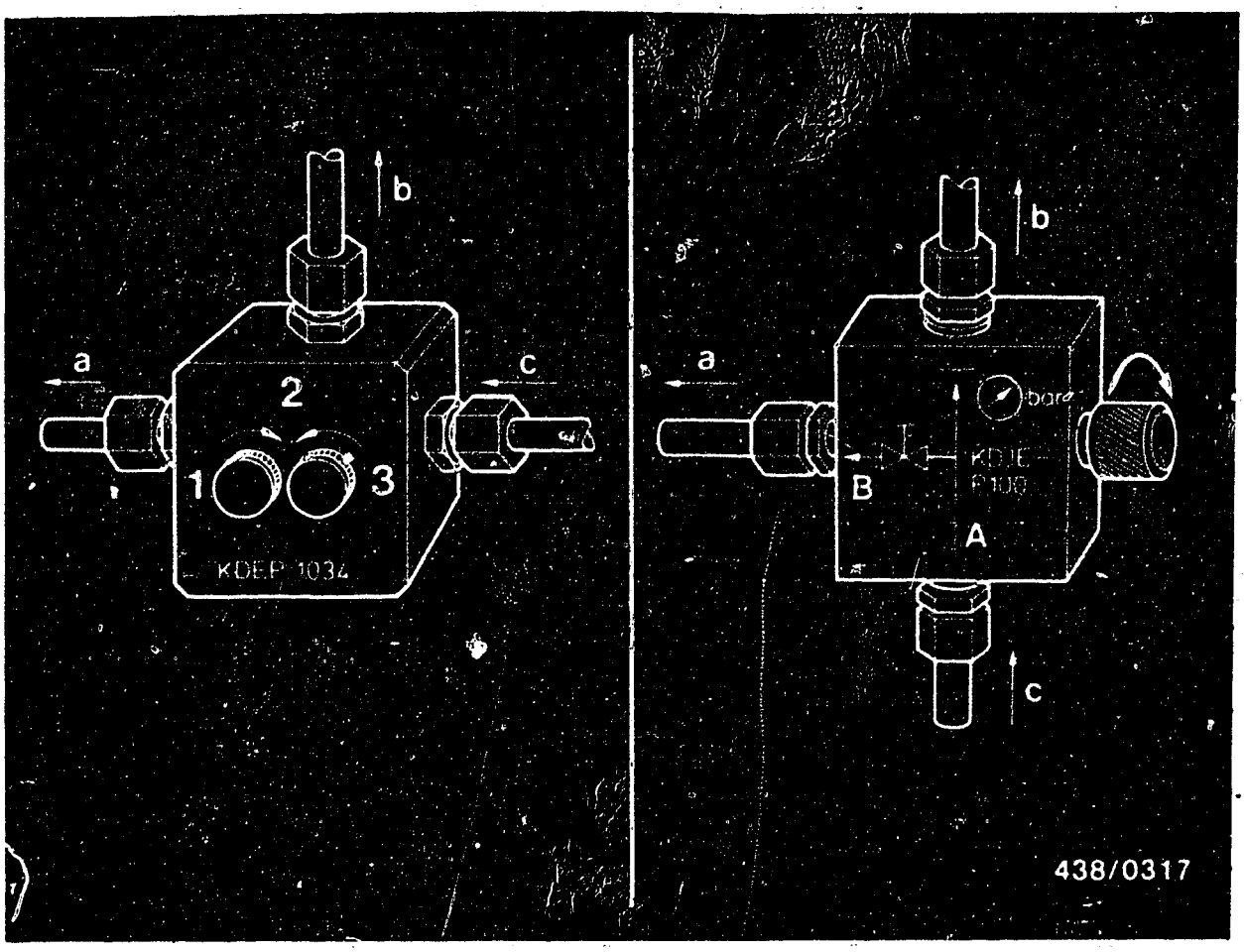


Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.
Test specifications for leak test:

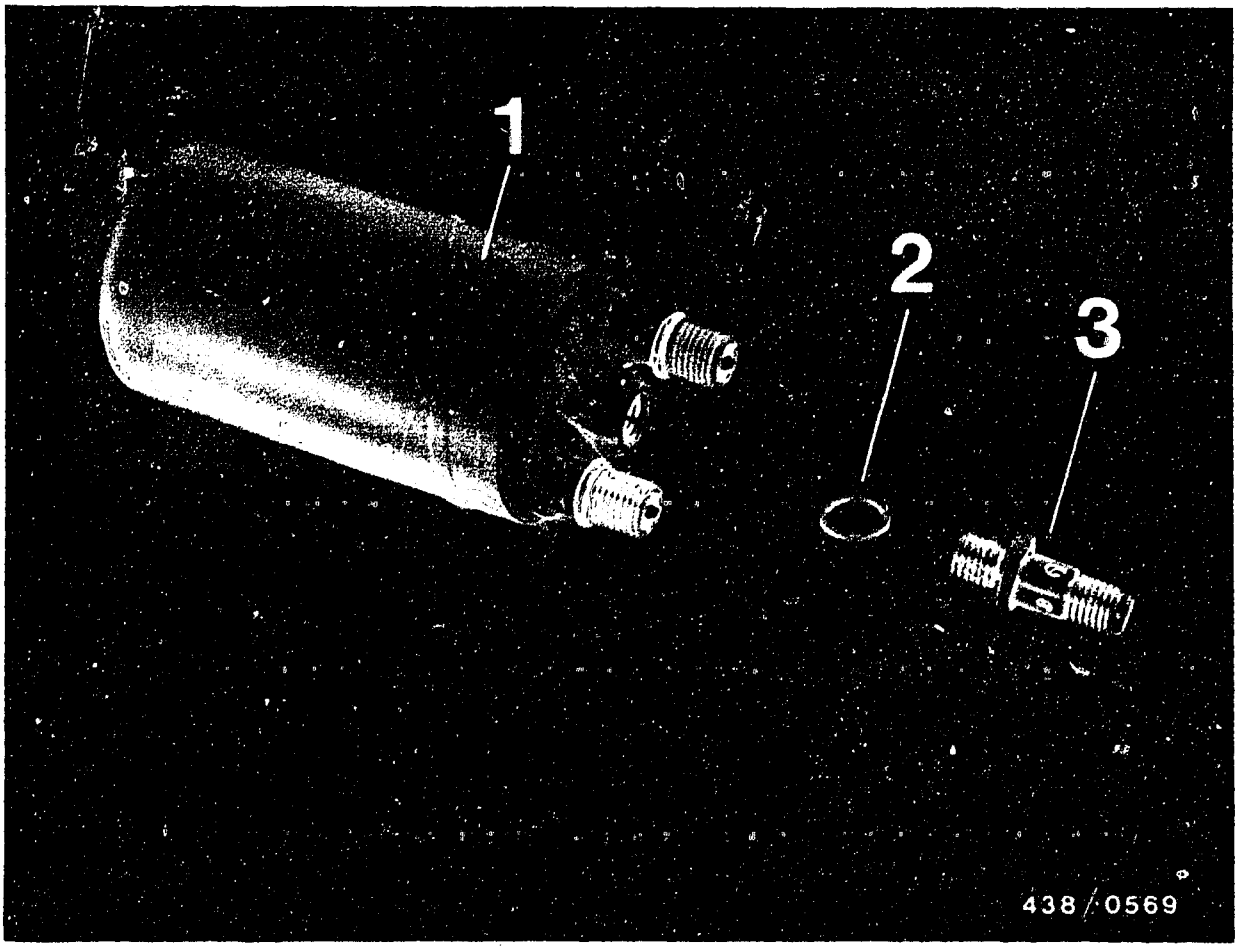
Minimum pressure after:

10 minutes: 1.6 bar (1.7 kgf/cm²) gauge pressure
20 minutes: 1.4 bar (1.5 kgf/cm²) gauge pressure



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.
Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.
If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting with non-return valve

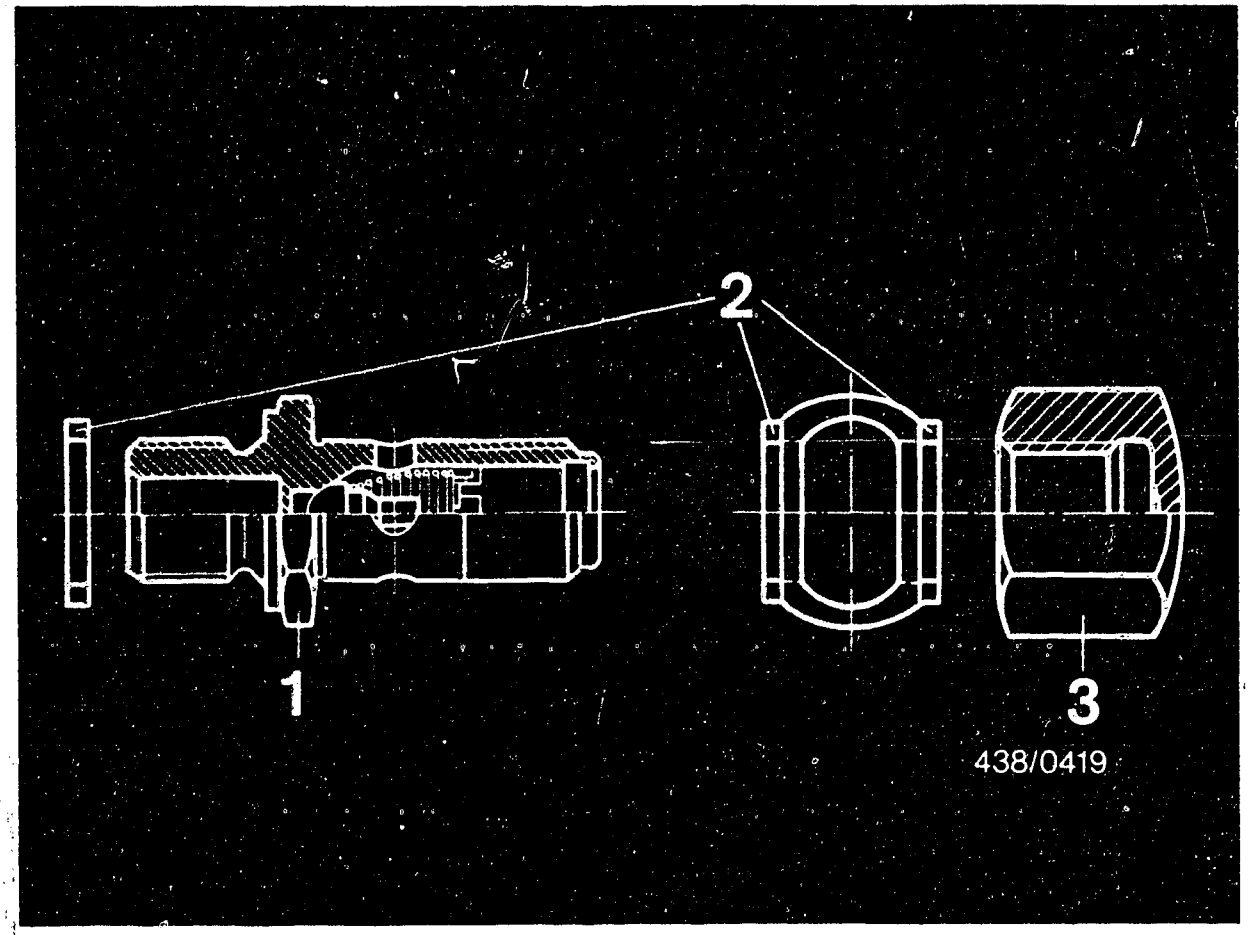
16.4 Possible causes of defect in the primary-pressure circuit:

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

The non-return valve is built into the tube fitting and cannot be exchanged.

In order to avoid having to change the whole electric fuel pump in the case of a leaking non-return valve, a parts set has been produced with a separate non-return valve, which can be used on the electric fuel pump installed in the Porsche 911 SC model.

Part number of the parts set: 1 587 010 003.
Contents: 1 tube fitting with built-in non-return valve
3 seal rings
1 cap nut



1 = Tube fitting with built-in non-return valve
2 = Flat seal rings
3 = Cap nut

Installation:
Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (between fuel tank and electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Unscrew the delivery line, collecting any escaping fuel, and unscrew the double threaded fitting out of the delivery fitting.

The defective original non-return valve remains in the electric fuel pump.

Screw the new non-return valve from the parts set into the delivery fitting with a seal ring and tighten to a torque of 17...25 Nm.

Connect the delivery line and remove the hose clamper from the intake hose.

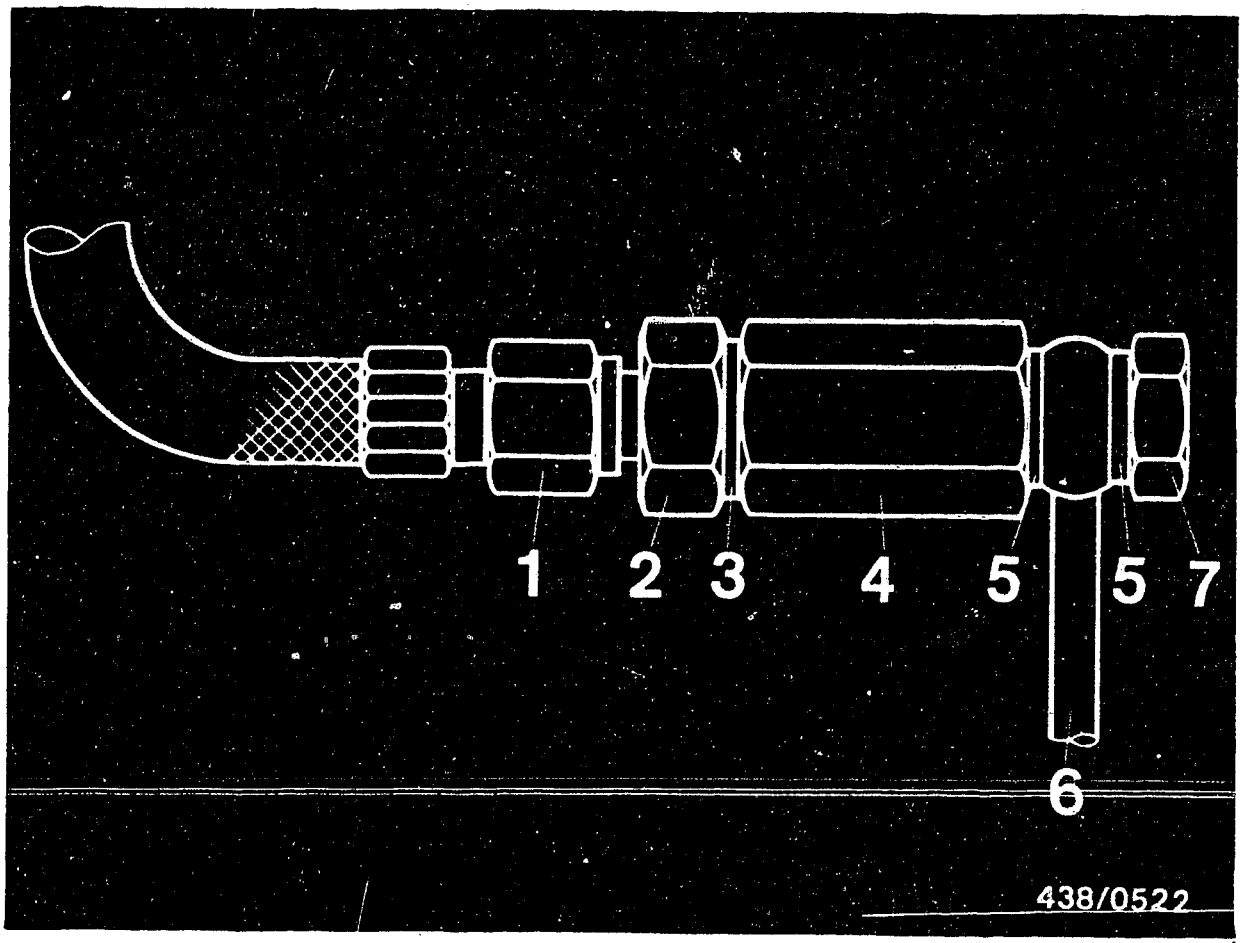
Check the connections for leaks with the electric fuel pump running.

- Start valve leaking.

Remove the start valve for testing. It is installed on the rear side of the intake housing below the throttle-valve assembly. For removal and installation it is advisable to use a mirror so that the connections and fastening screws can be seen.

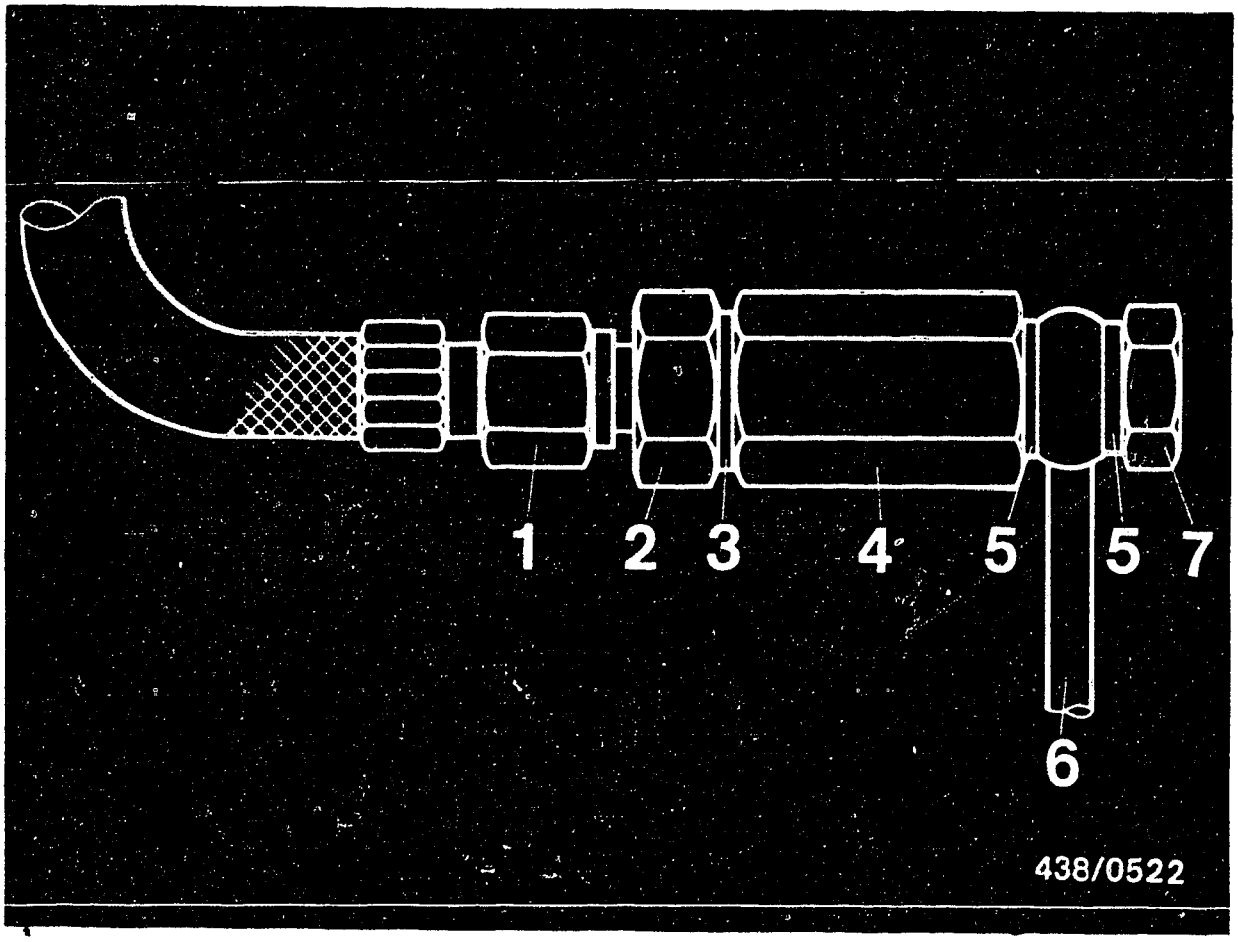
On the 1978-1980 models the fuel line (polyamide line) remains connected for testing.

On the 1981 model (steel line) unscrew the fuel line from the valve and re-connect as follows using a flexible hose line:

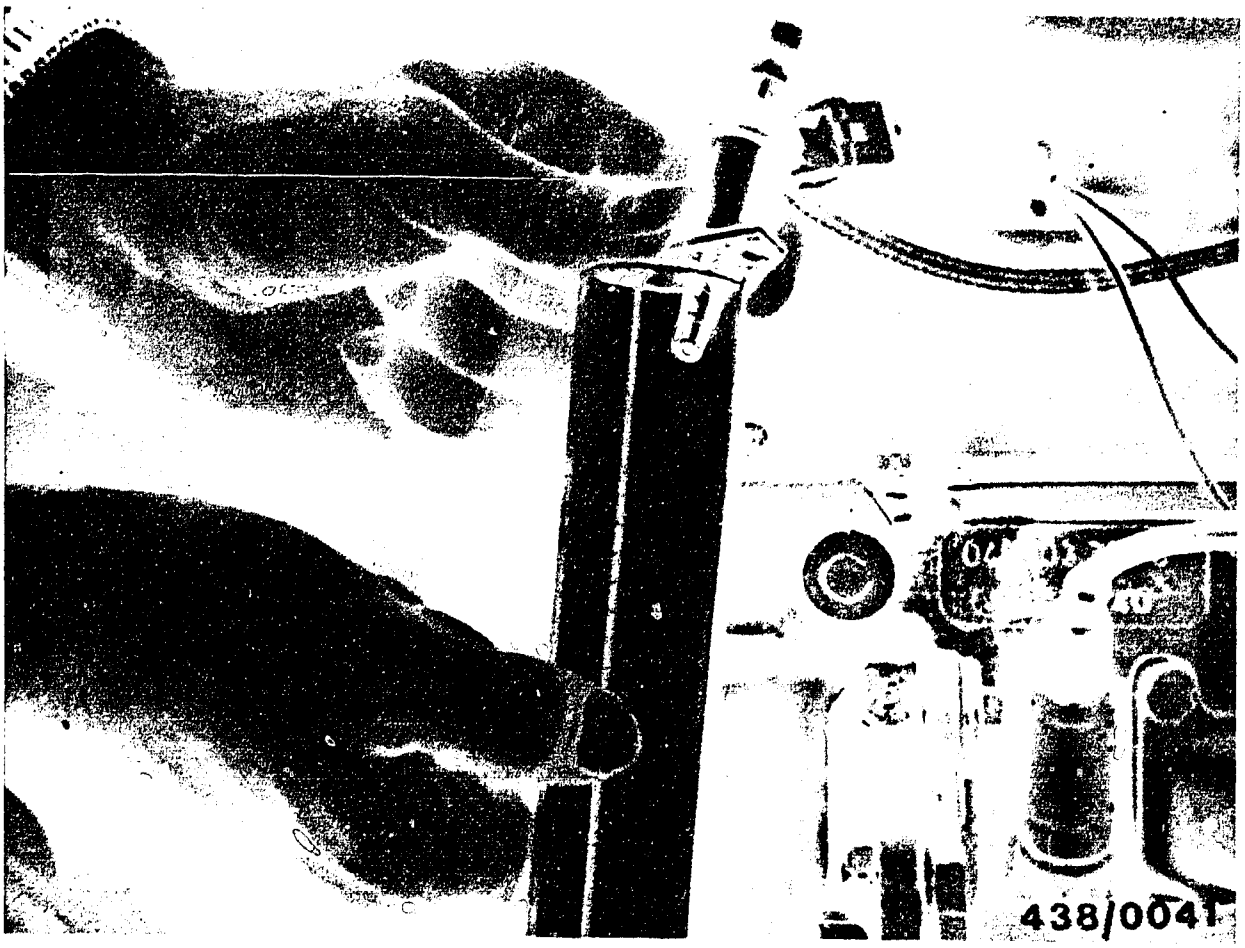


1 = Hose line of pressure tester KDJE-P100
2 = Double threaded fitting 2 x M 12x1.5, 1x60° internal taper
3 = Seal ring
4 = Adapter from connecting-parts set KDJE-P100/10
5 = Seal rings
6 = Fuel line
7 = Original inlet-union screw

Connect the fuel line with the original inlet-union screw to the adapter from the connecting-parts set KDJE-P 100/10 (formerly KDEP 1034/10). Screw a commercially-available double fitting 2 x M 12x1.5 into the adapter.

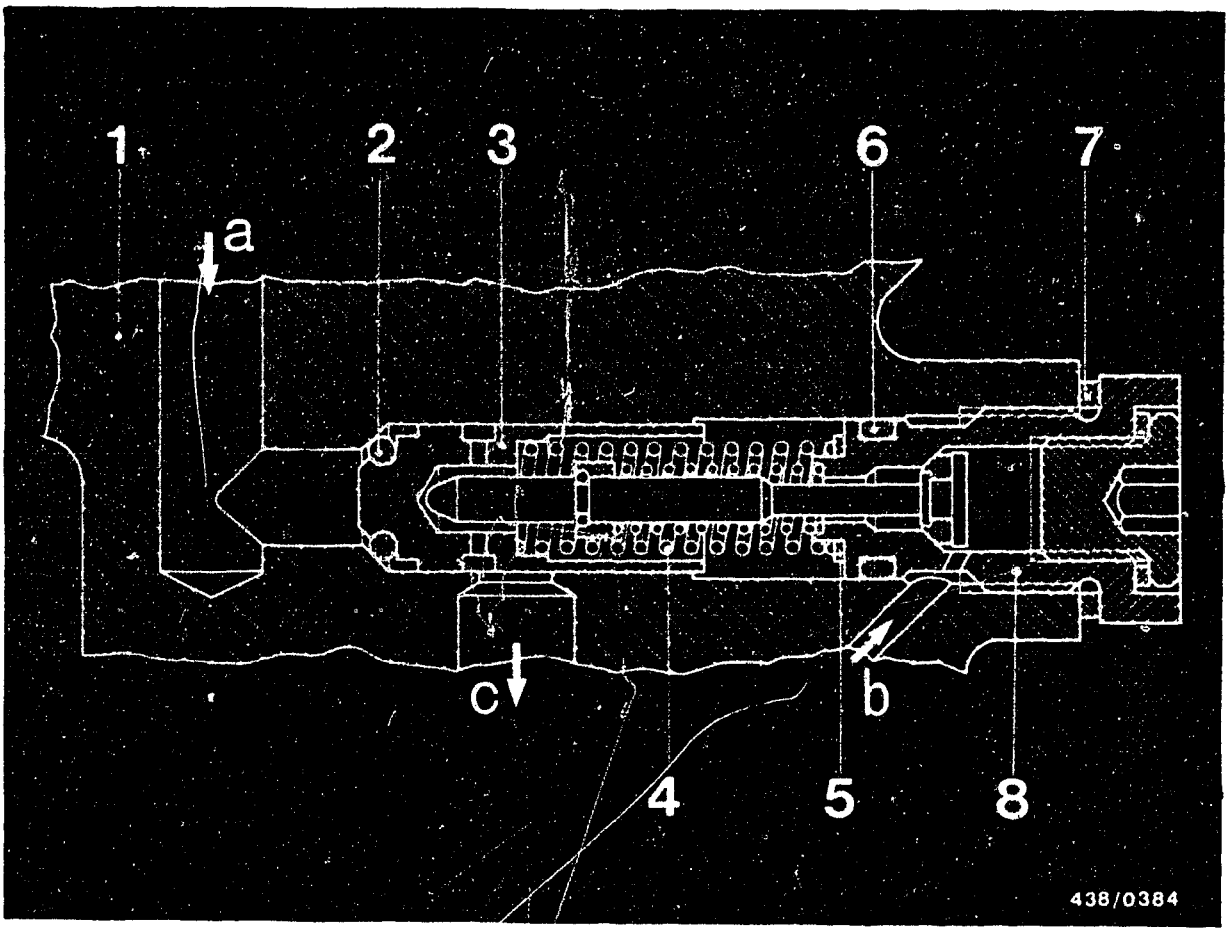


Connect a hose line of the pressure tester KDJE-P 100 (formerly KDEP 1034) to the double fitting. Using connecting piece M 12x1.5/M 8x1 from the connecting-parts set, connect the start valve to the hose line.



Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
The safety circuit remains bridged so that primary pressure is applied to the start valve.

No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve, if leaky.
When a leaky start valve has been replaced it is necessary finally to adjust the idle speed with the engine at operating temperature (Coordinates F 20).

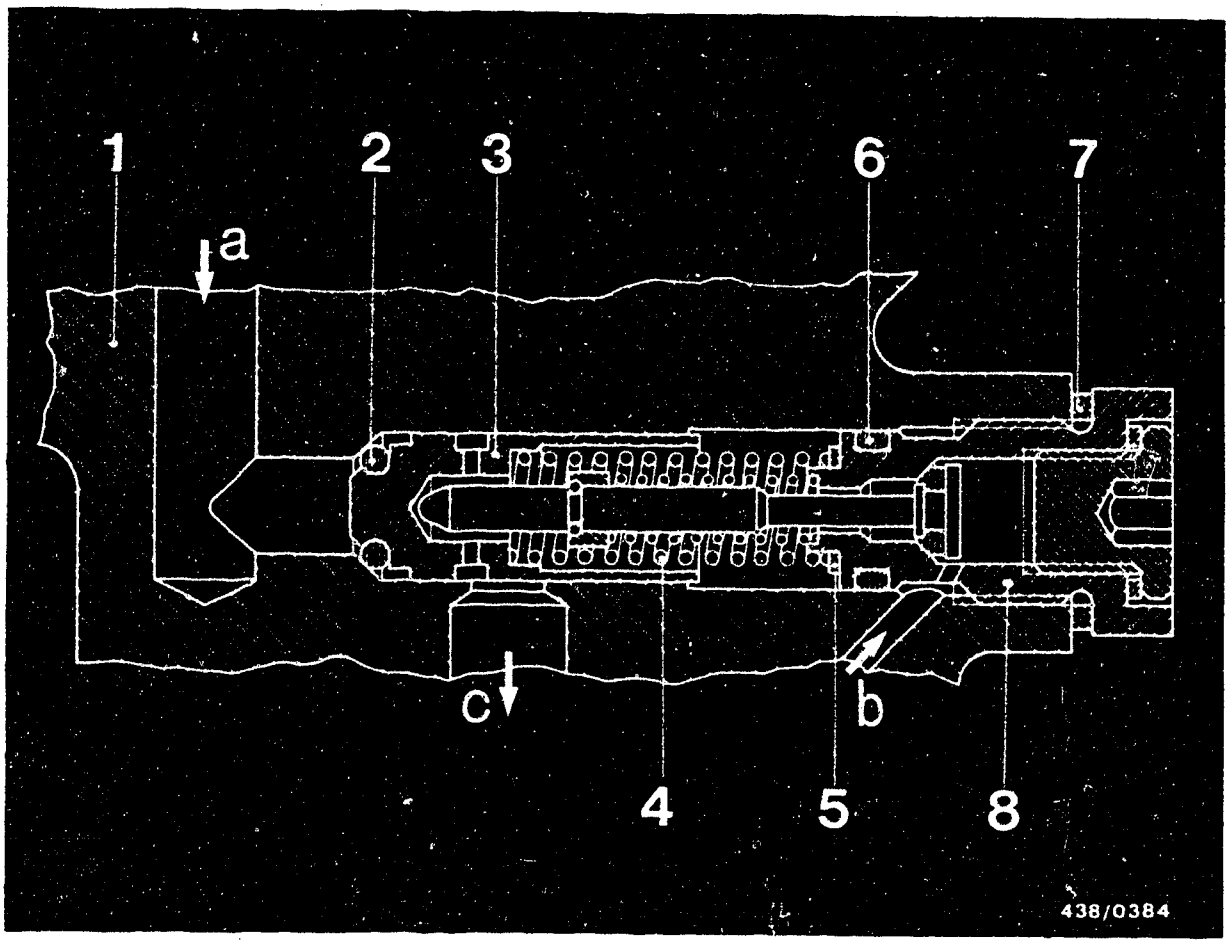


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

- Seal ring on control piston of primary pressure regulator has a leak.

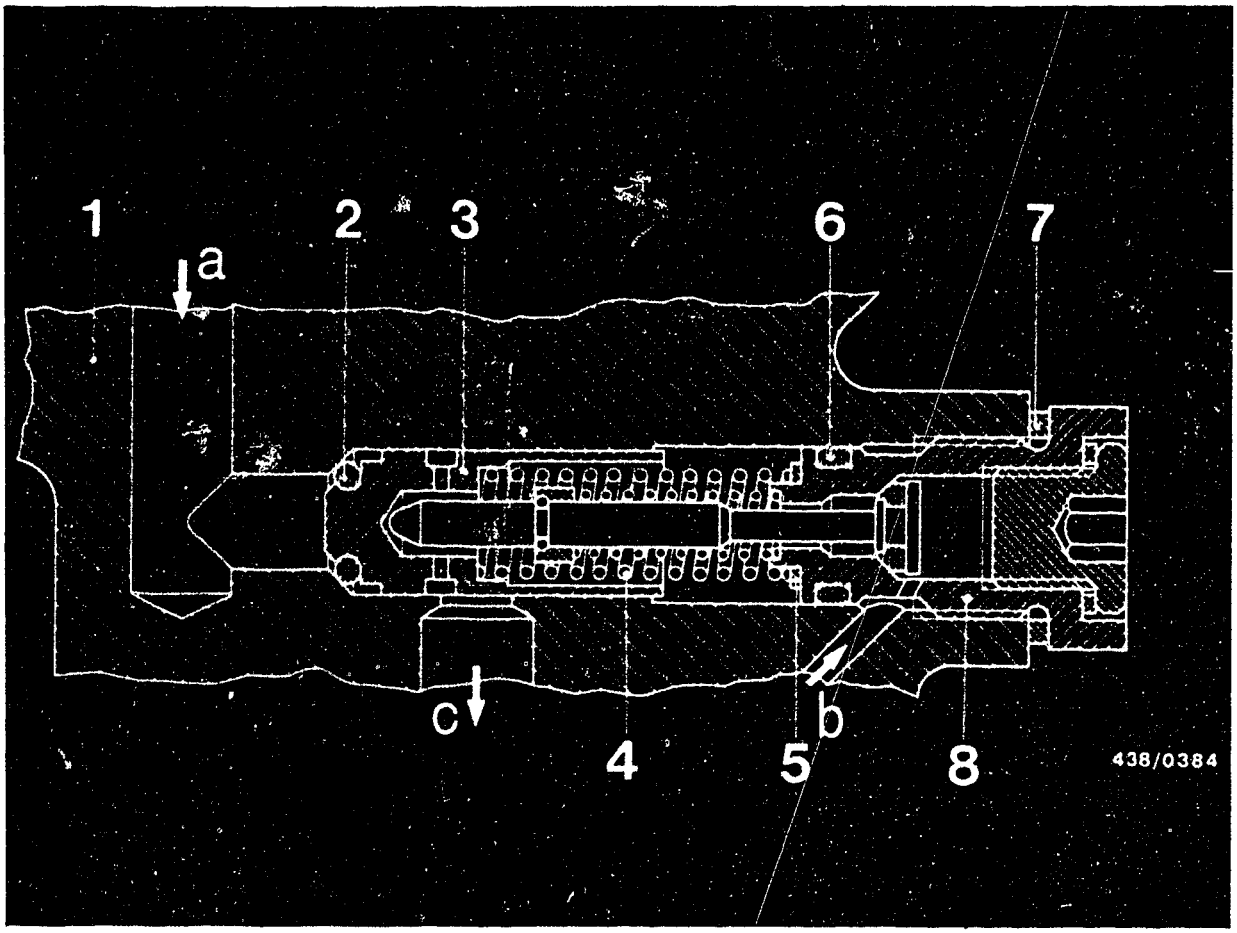
Replace seal ring:
Clean the fuel distributor in the region of the primary-pressure regulator.

Screw out the large screw plug (8) with the complete push valve. Also remove shims (5), control spring (4) and control piston (3).



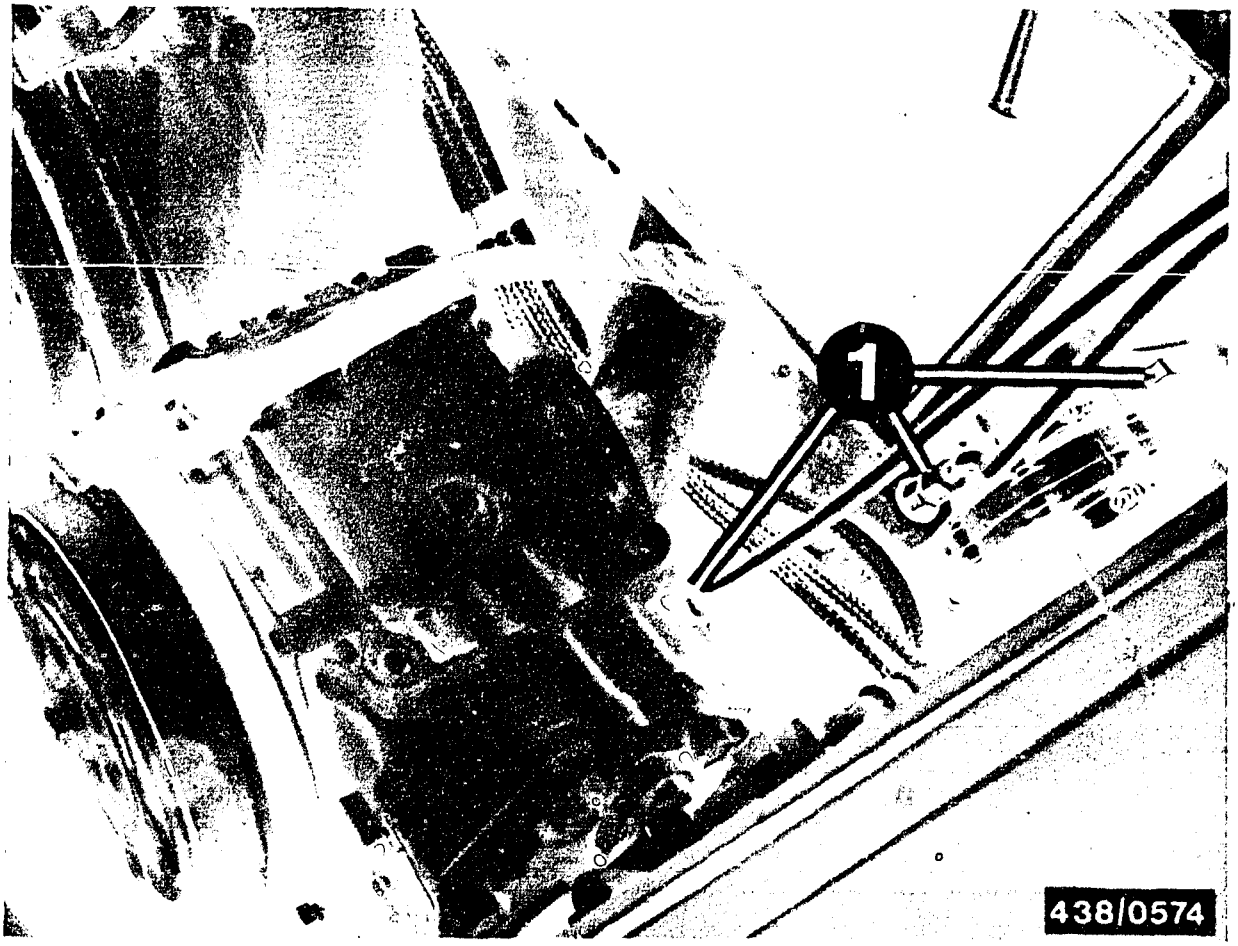
a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

Replace O-ring (2), fit control piston and control spring. Screw in screw plug with complete push valve and with shims (as they were before removal) and new seal rings (6 and 7).
Finally check primary pressure (Coordinates D 12) and, if necessary, adjust by changing the shims (5).



16.5 Possible causes of a defect in the control-pressure circuit:

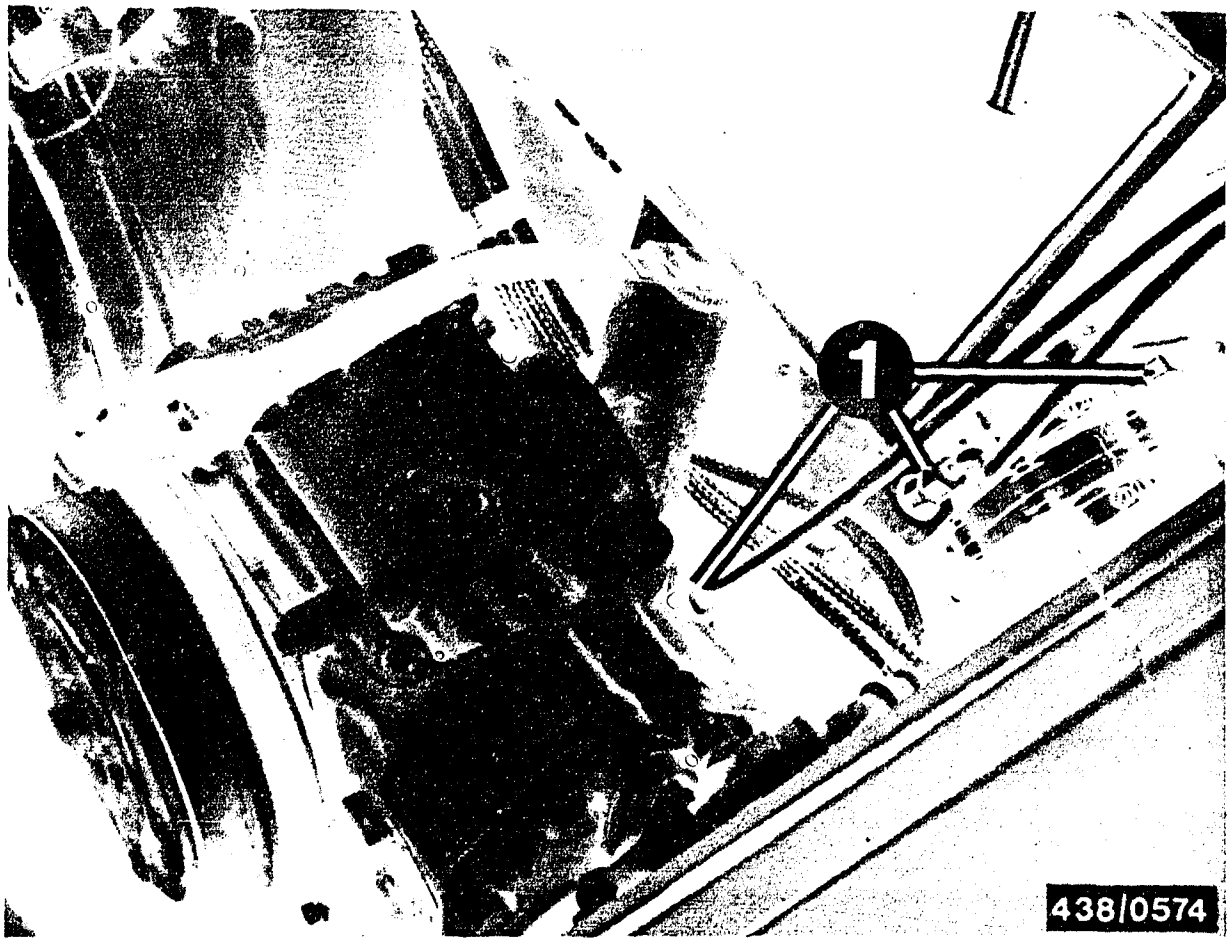
The push valve has a leak.
Since the seal ring of the push valve is rigidly vulcanized onto the valve needle, the screw plug must be changed with the complete push valve (ready-assembled unit).
Clean the fuel distributor in the area of the primary-pressure regulator. Screw out large screw plug (8) with complete push valve. Be careful with the control spring (4) and the shims (5).
Screw in new push valve with the same number of shims (5) as before, new O-ring (6) and flat seal ring (7).
Finally check the primary pressure once again and adjust if necessary (Coordinates D 12).



17. Testing the injection valves

- Remove the injection valves:

The injection valves are plugged into the flanges of the intake tubes.
Unscrew the fuel-injection lines, applying counter-force at the fixed hexagonal section of the injection valves (1). Remove the injection valves from the holding sleeves (in the intake-tube flange), and, using a small screwdriver, lift out any of the rubber cup seals which remain in the holding sleeves.
Do not damage the holding sleeve when doing this (plastic).



• Installation:
Check the rubber cup seals for damage. Replace if necessary. Wet the rubber cup seals with engine oil and fit.

Force the injection valves as far as they will go into the holding sleeves. The rubber cup seal must be underneath the bead in the holding sleeves.

Re-connect the fuel-injection lines, applying counterforce at the fixed hexagonal section of the injection valves.

17.1 Test equipment and test media

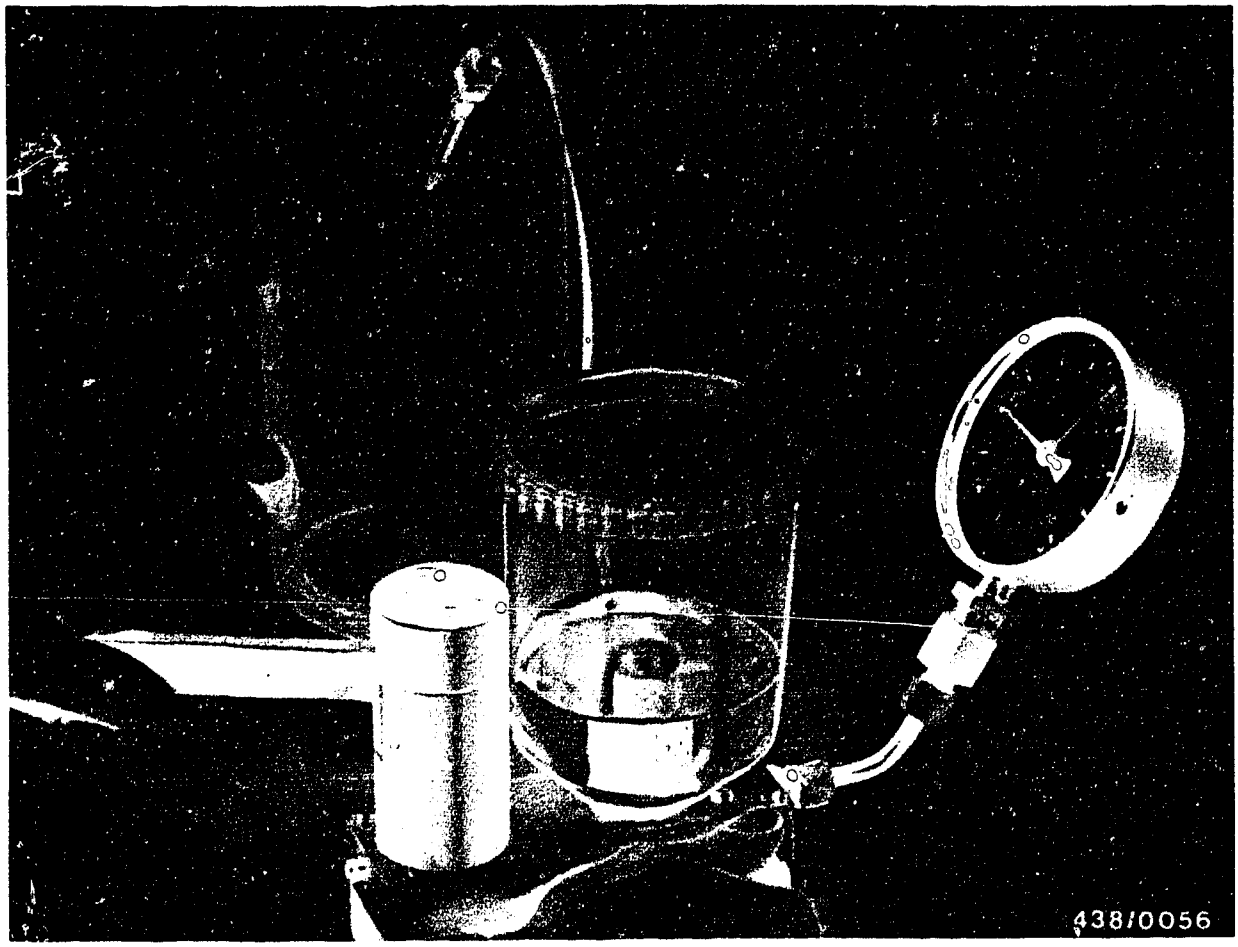
The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch Part No. VS 14 942-CH
former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

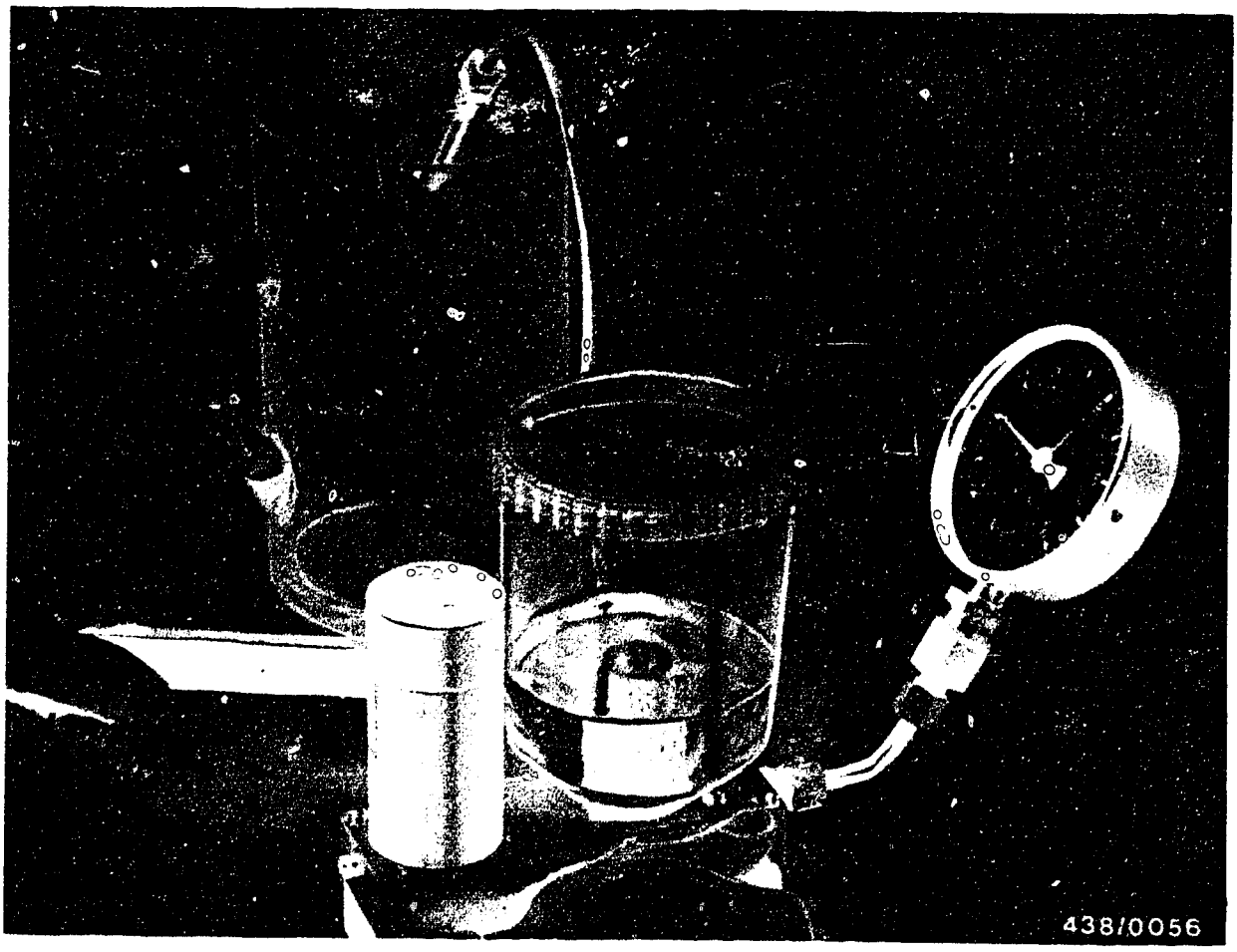
Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.

Even with calibrating fluid, be sure to observe the local official regulations.



17.2 Connecting the injection valve to the tester

Remove injection valve for testing, connect to valve tester and bleed the discharge tubing by moving the lever back and forth several times with the union nut open. Then tighten the union nut.

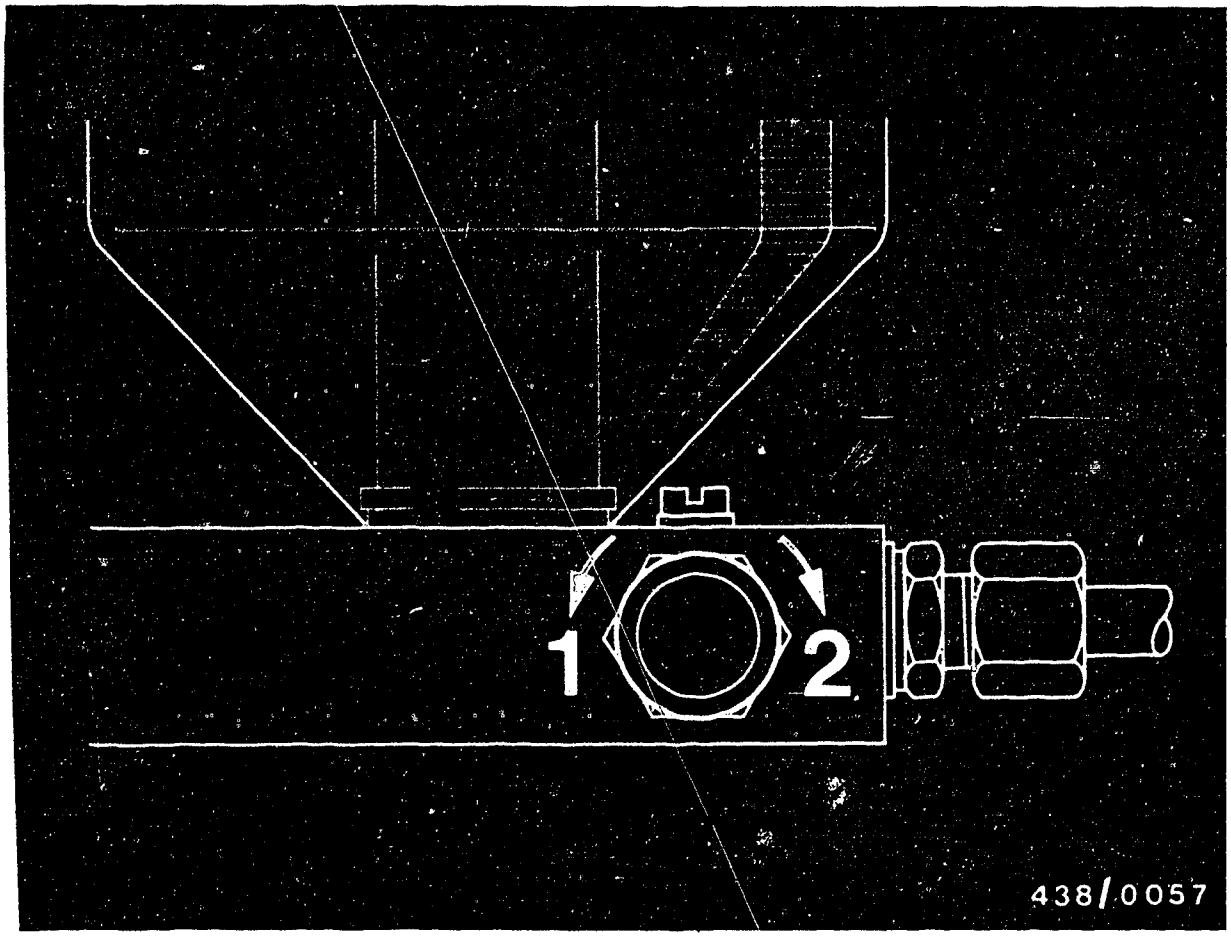


17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).

You can try to flush the injection valve clear by moving the lever back and forth several times strongly.

If this attempt is successful continue the test. If it is not possible to flush the valve clear, replace it.

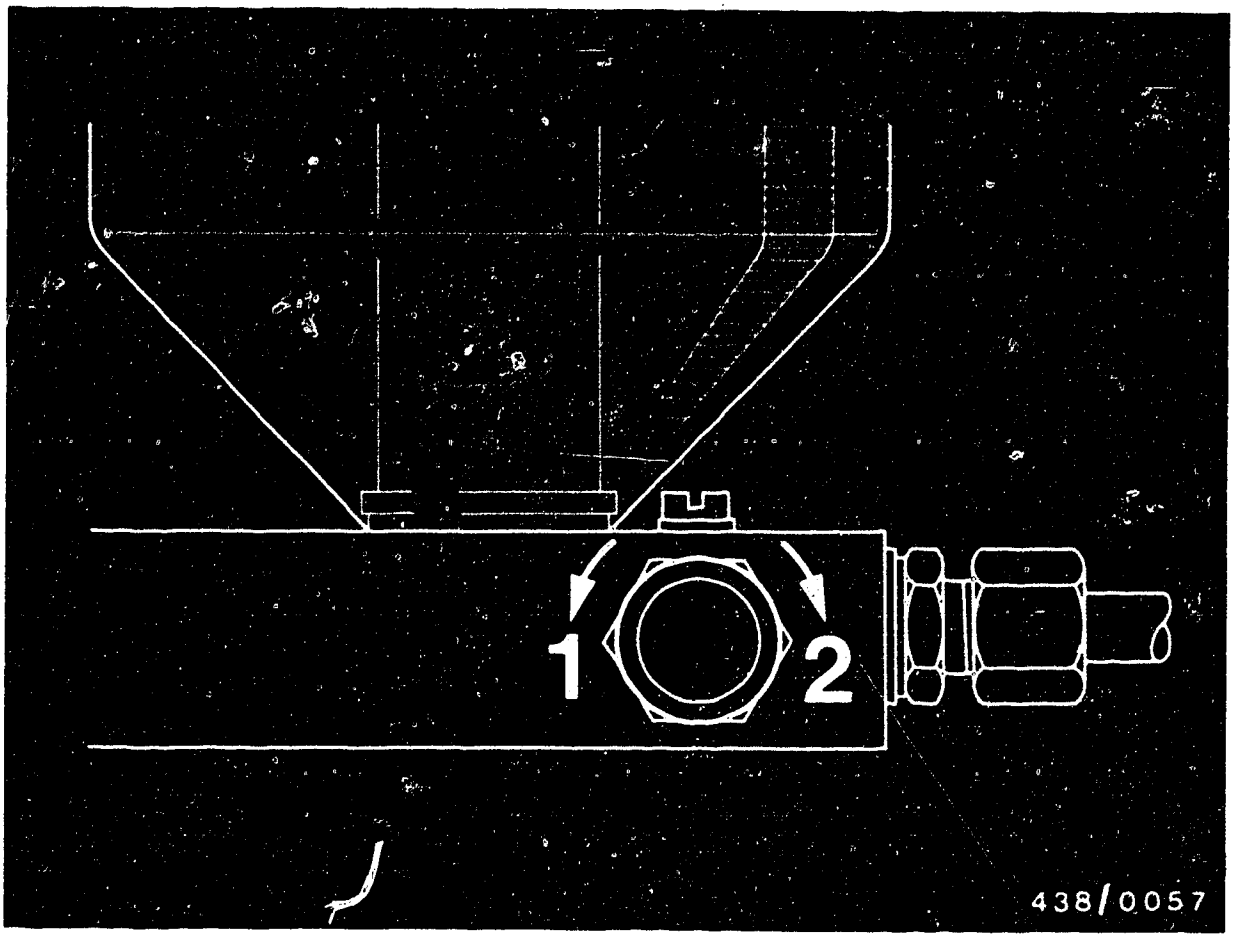


1 = Open 2 = Close

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - Opening pressure (gauge pressure)
0 437 502 004	2.5...3.6 bar (2.6...3.7 kgf/cm²)

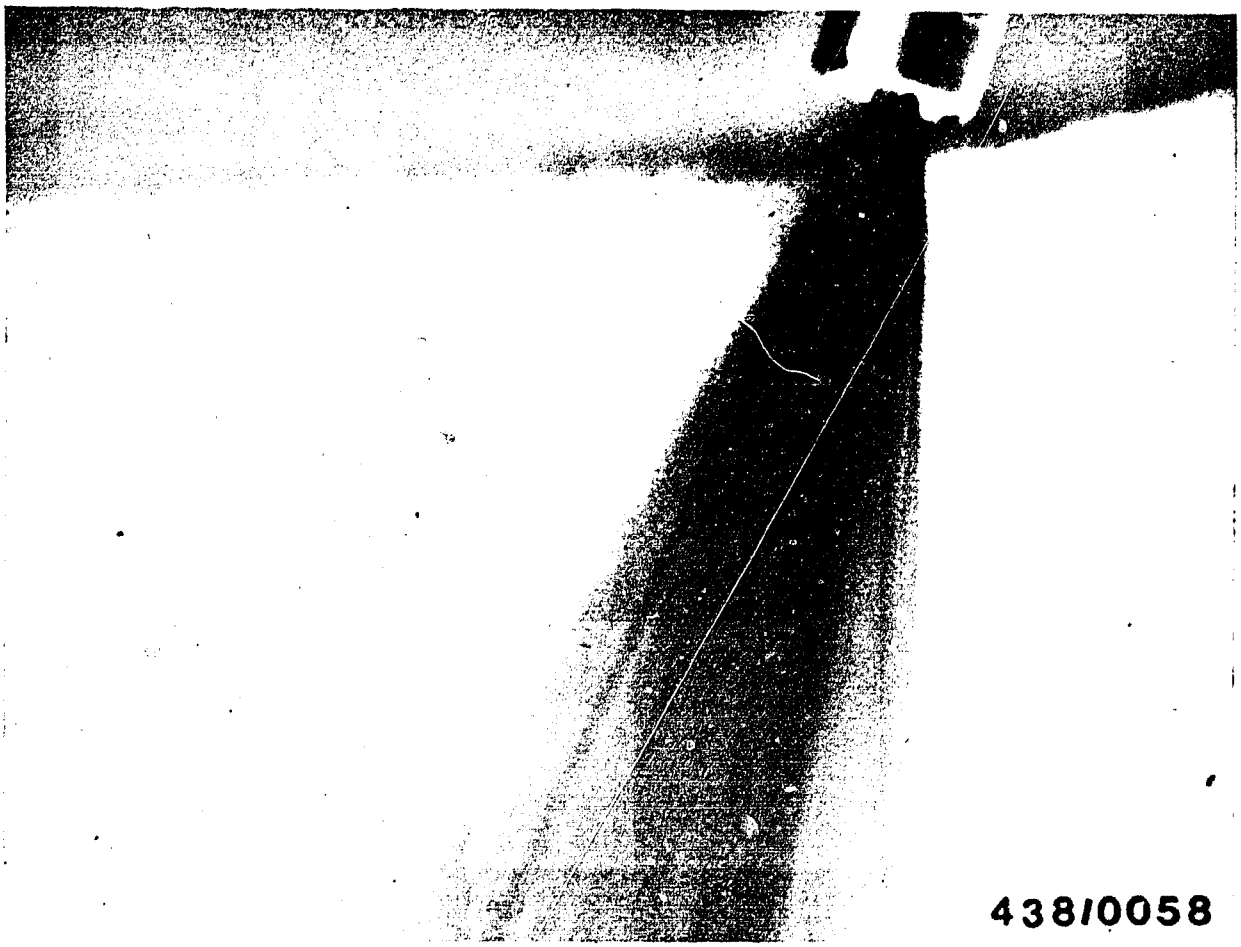
With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).
If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.



1 = Open 2 = Close

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.5 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.

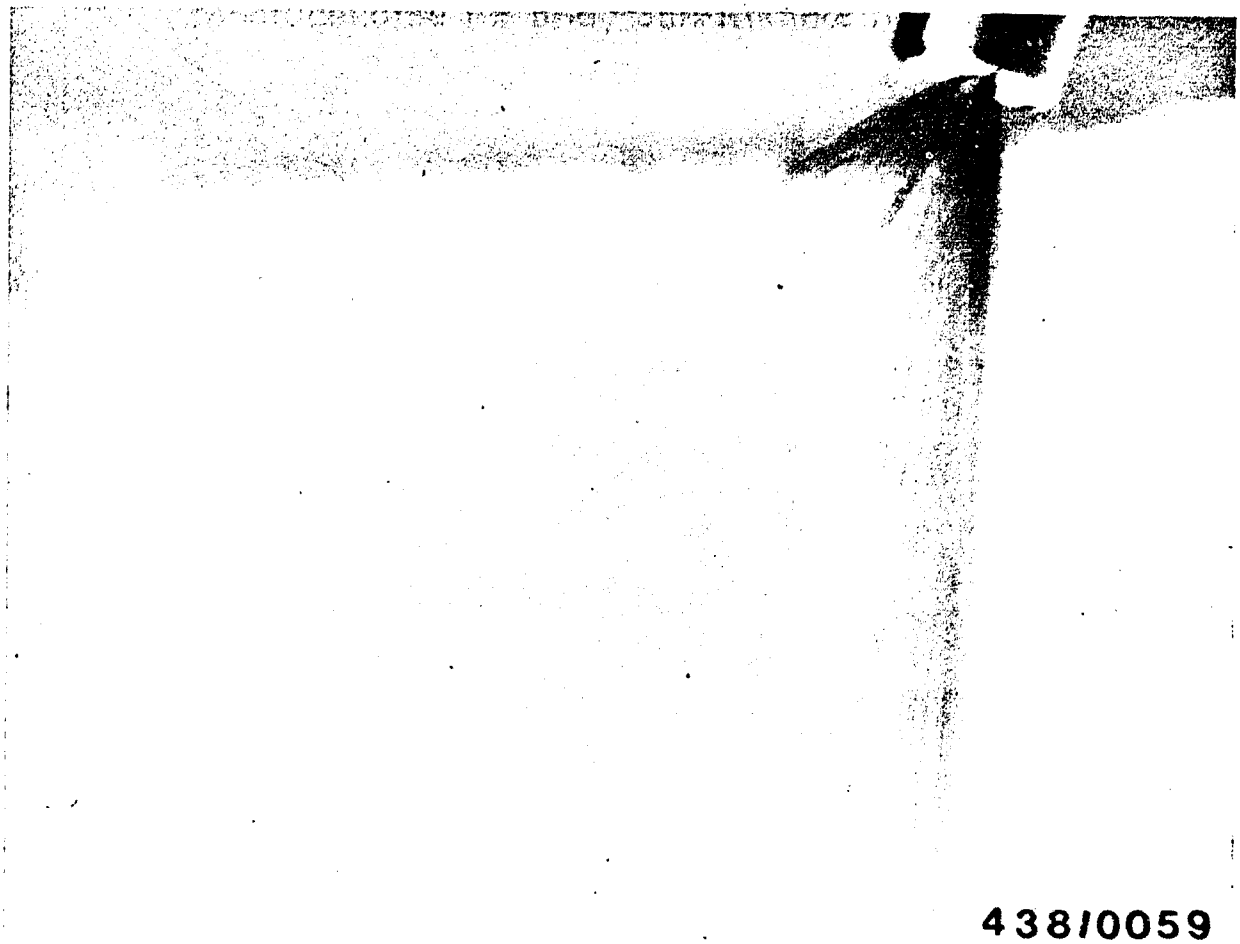


438/0058

17.6 Chatter test, evaluation of spray

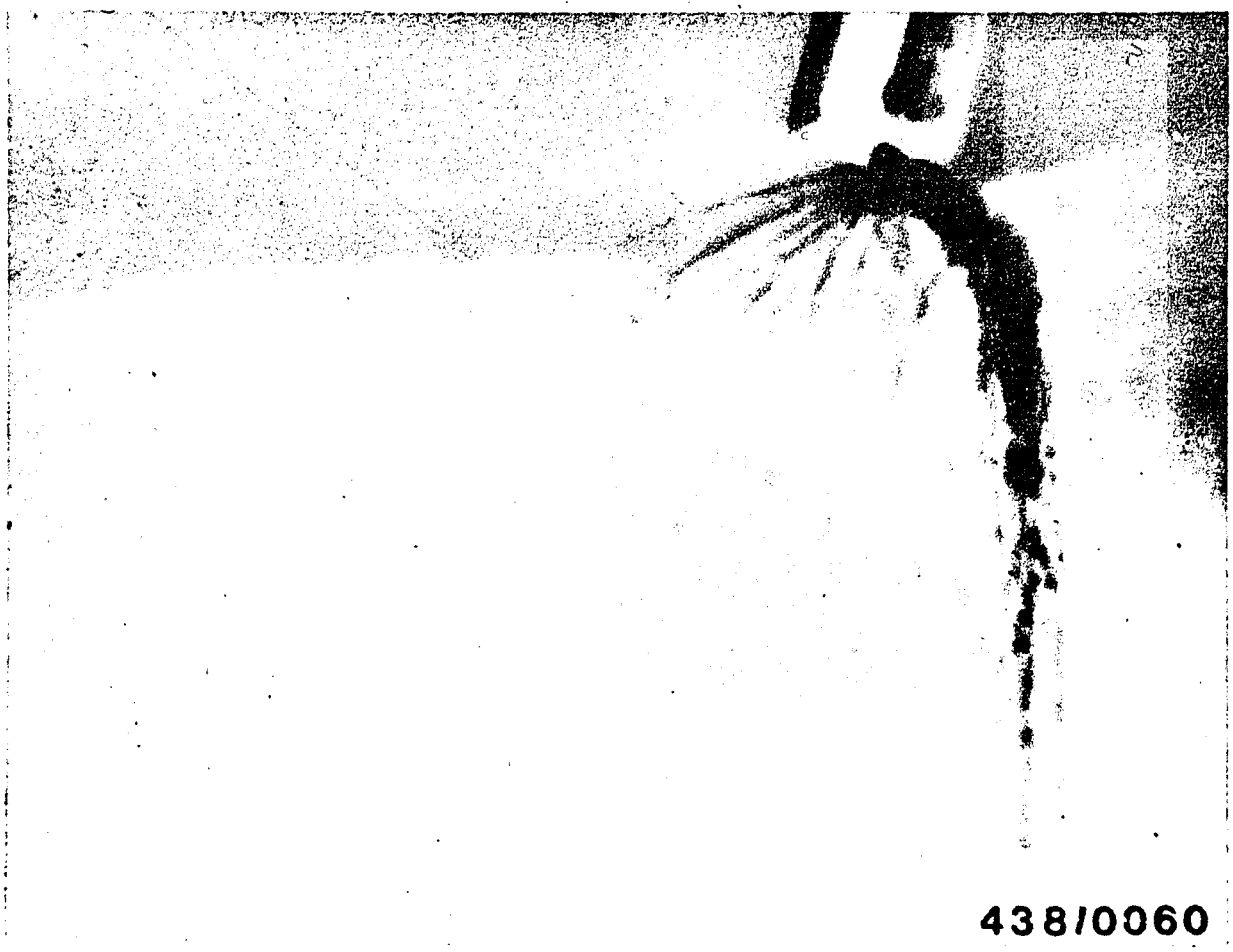
Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.



438/0059

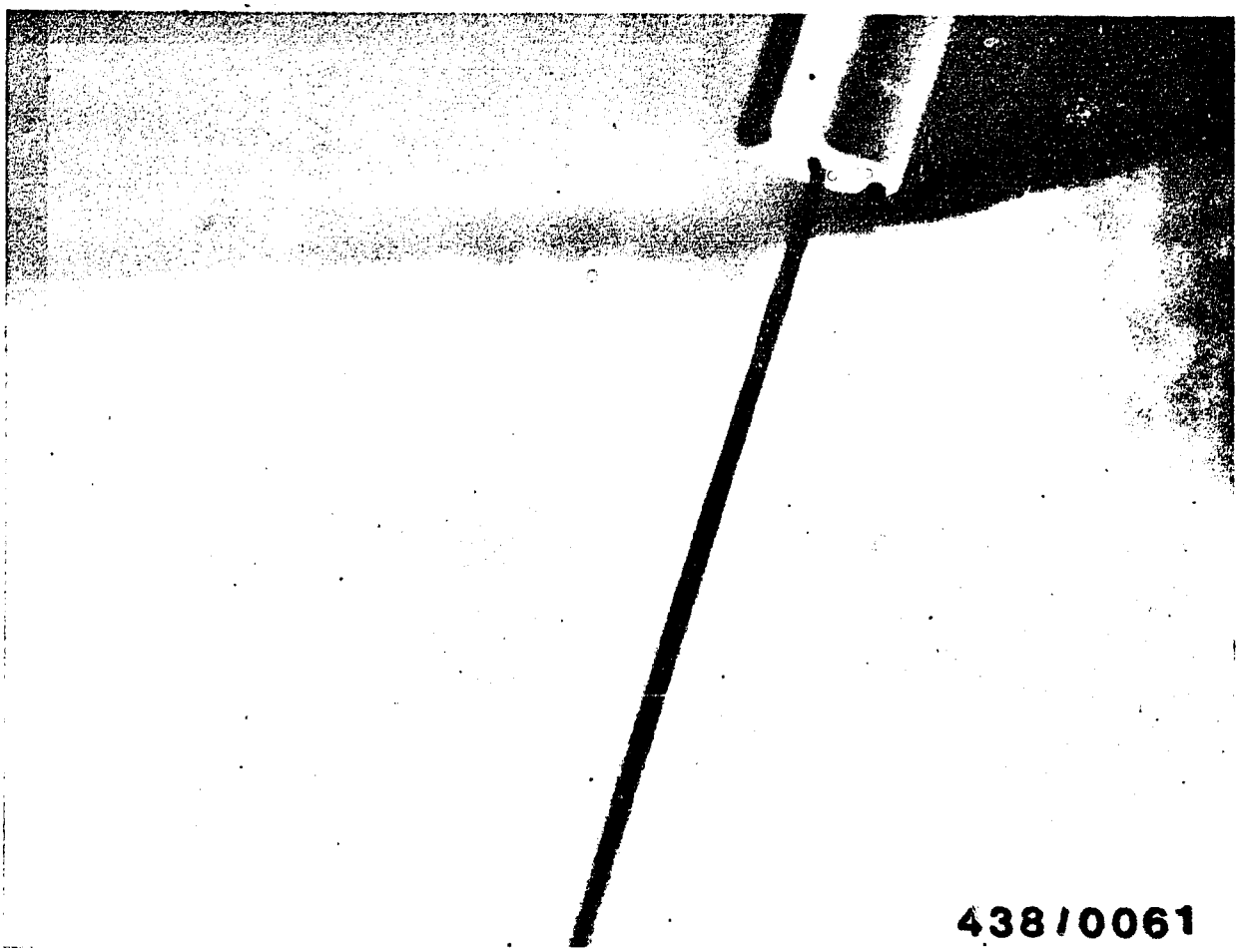
Illustration shows single-sided but nevertheless good spray formation.



438/0060

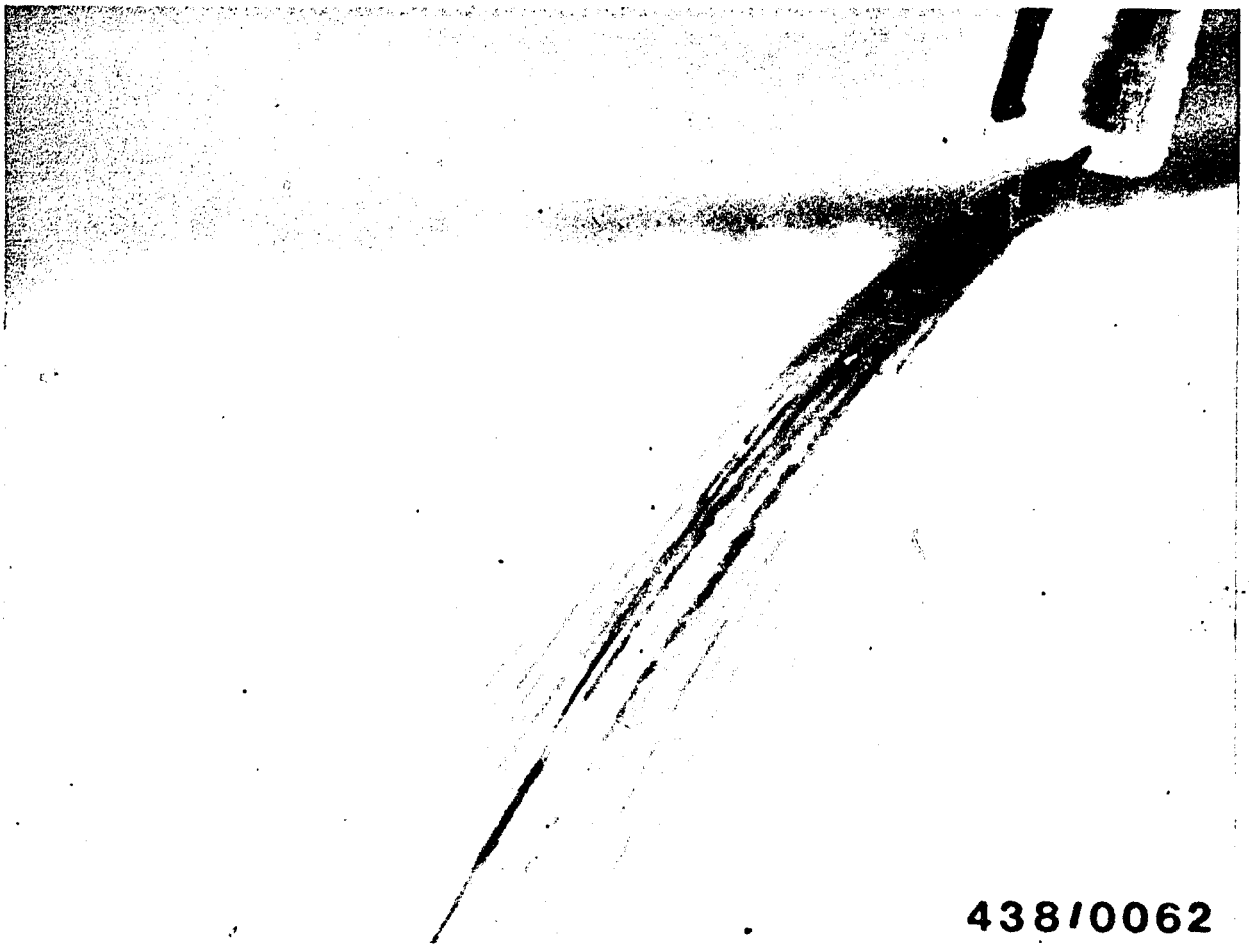
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.



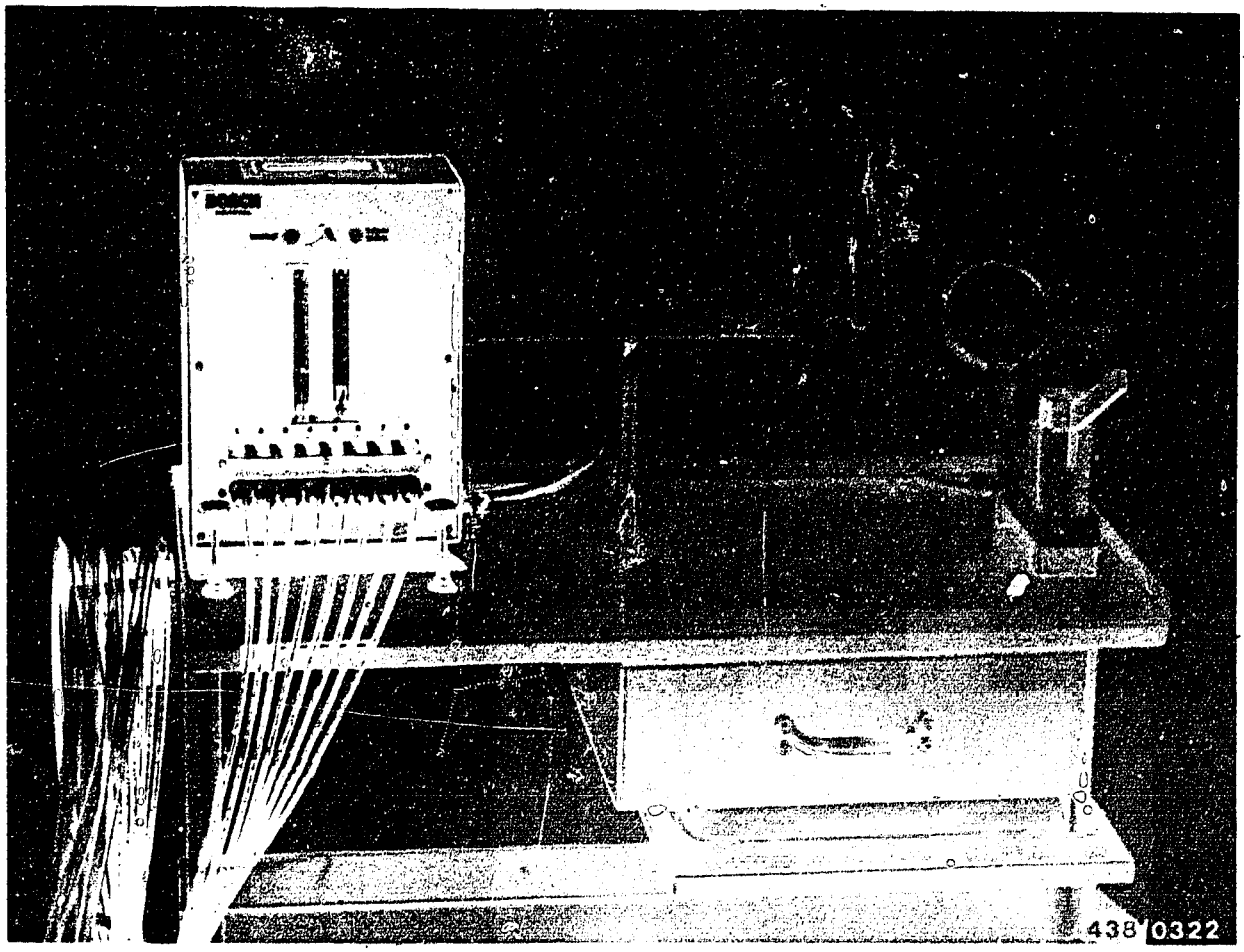
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 20.

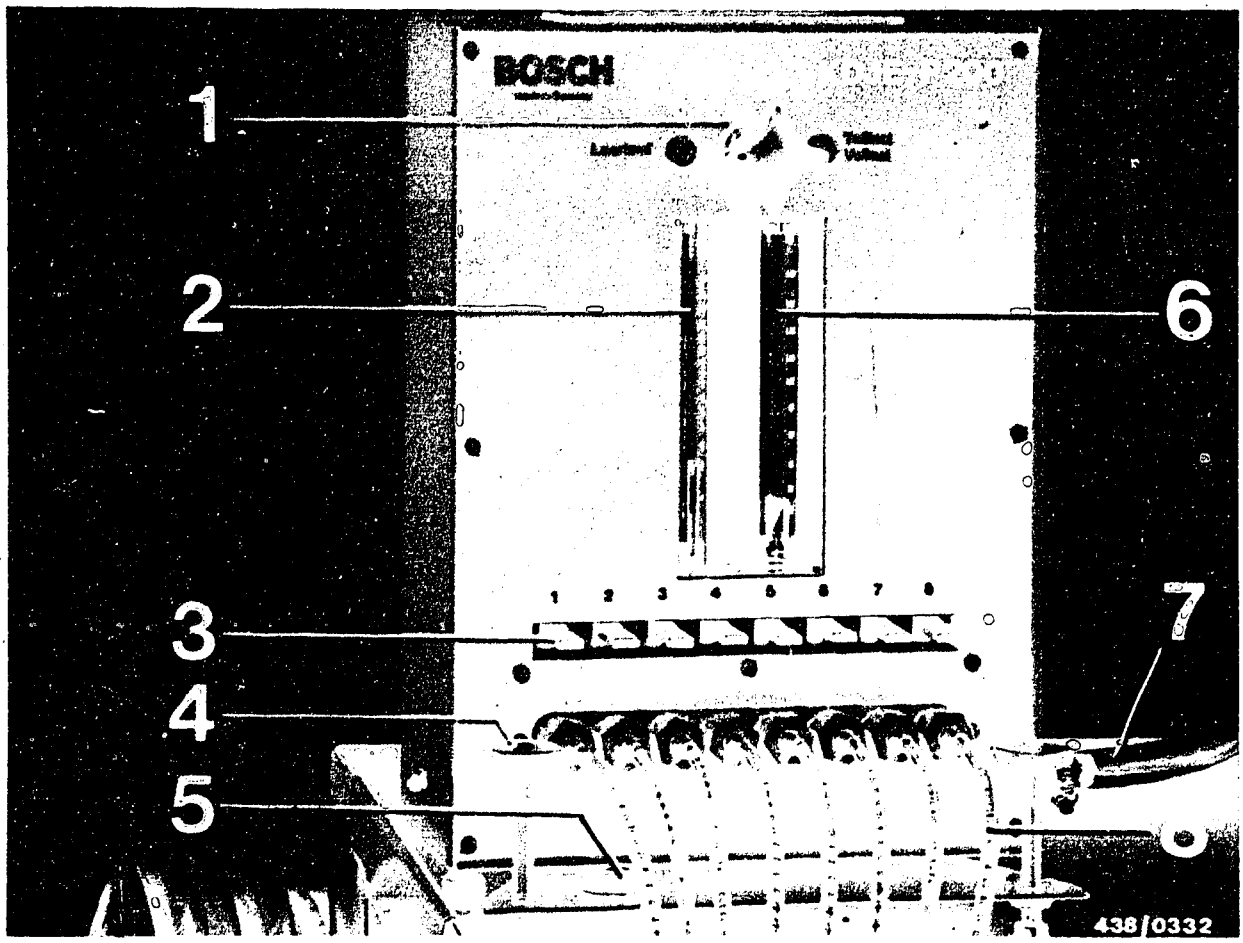


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

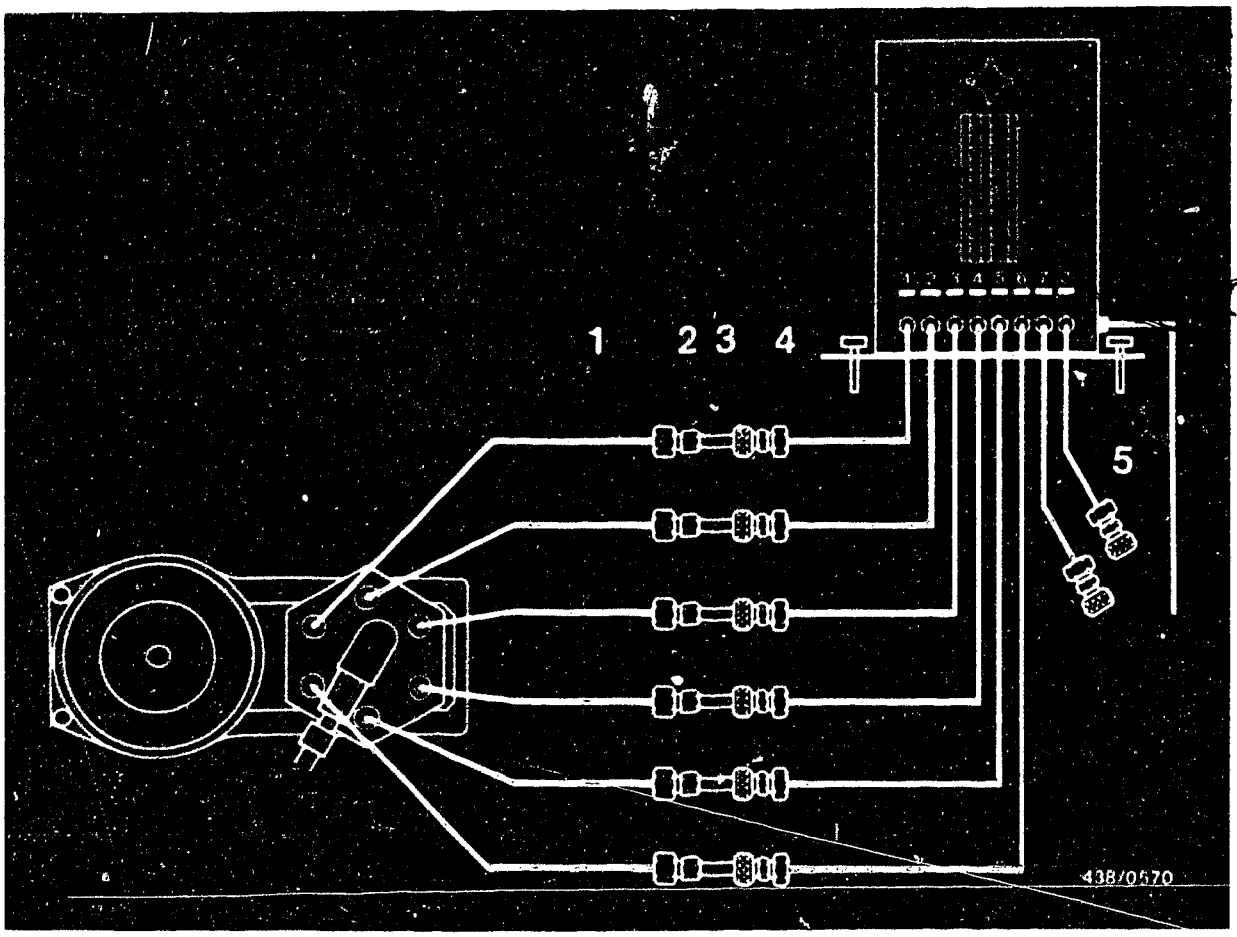
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (3) and a 3-way stopcock (1).

The small rotameter tube (2) is used for the idle measurement while the large tube (6) is used to measure the fuel delivery at part and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (7) about 5 m long.

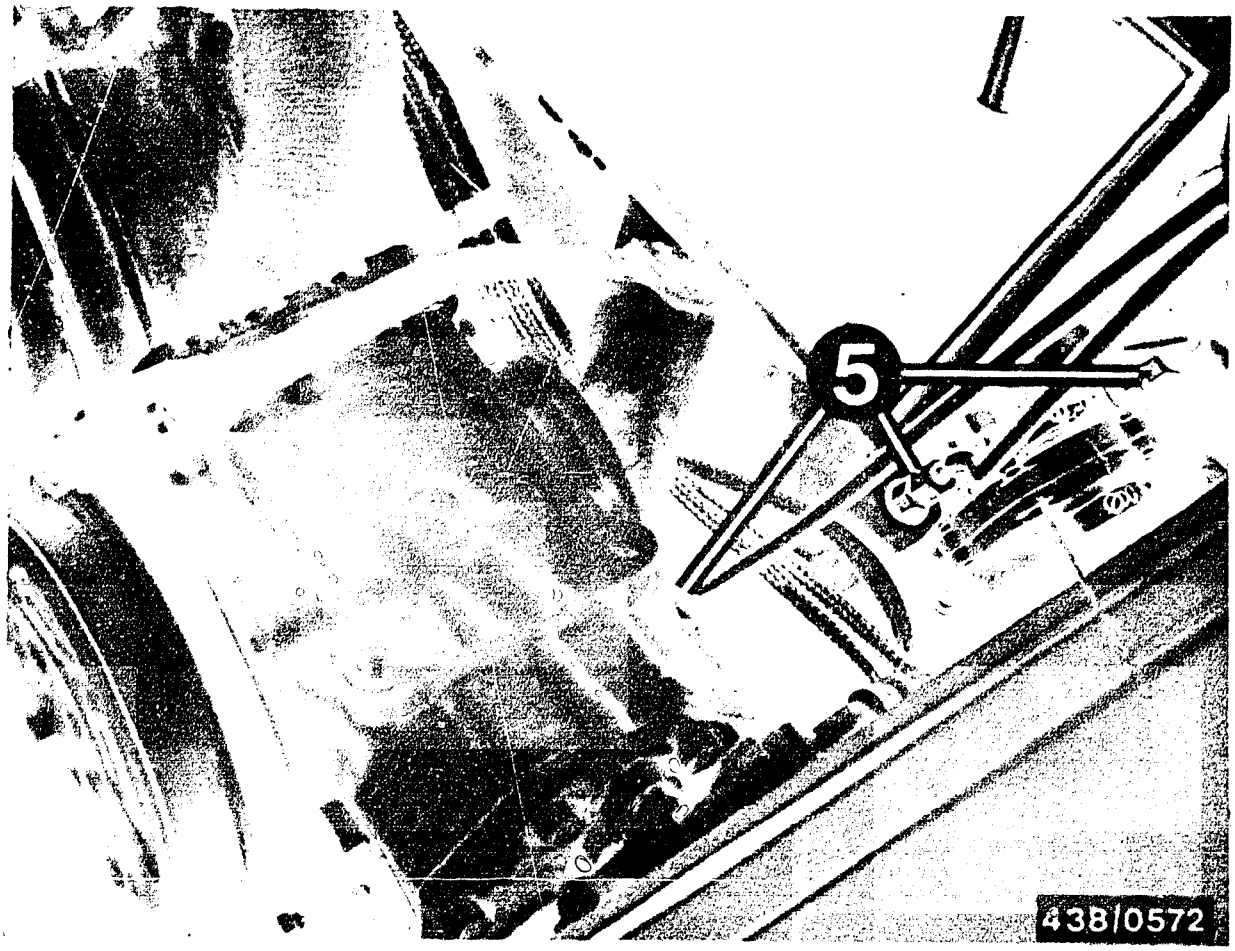
The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = On model 1978-1980: Fuel-injection lines.
On model 1981: Adapter lines from line set KDJE-P 200/25. Connection to fuel distributor with double threaded fitting M 8x1/M 10x1.
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

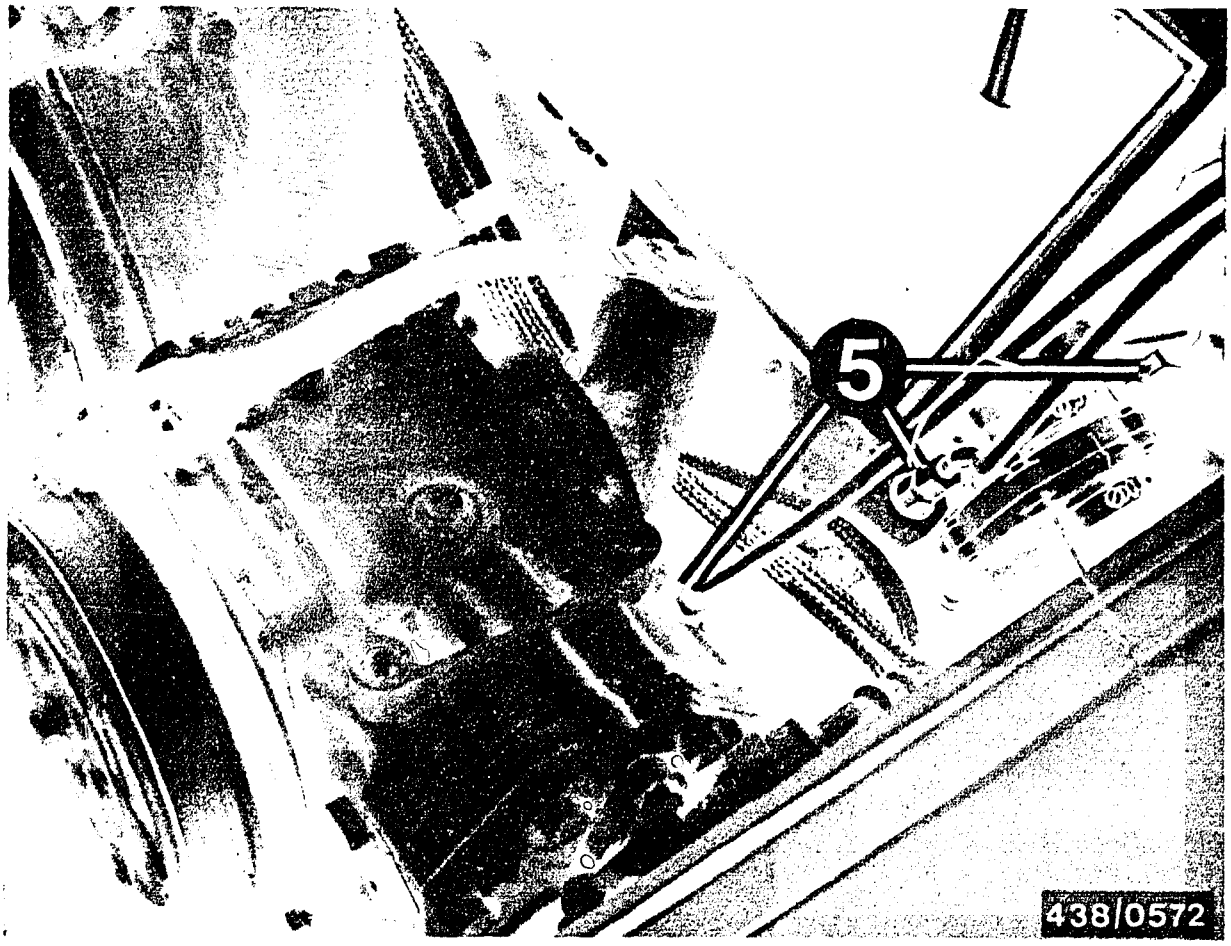
18.3 Setting up and connecting the tester for delivered quantity comparison:

Set the tester up beside the vehicle on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level (water level at base of the tester).



Remove the injection valves (5) for testing. They are plugged into the flanges of the intake tubes.

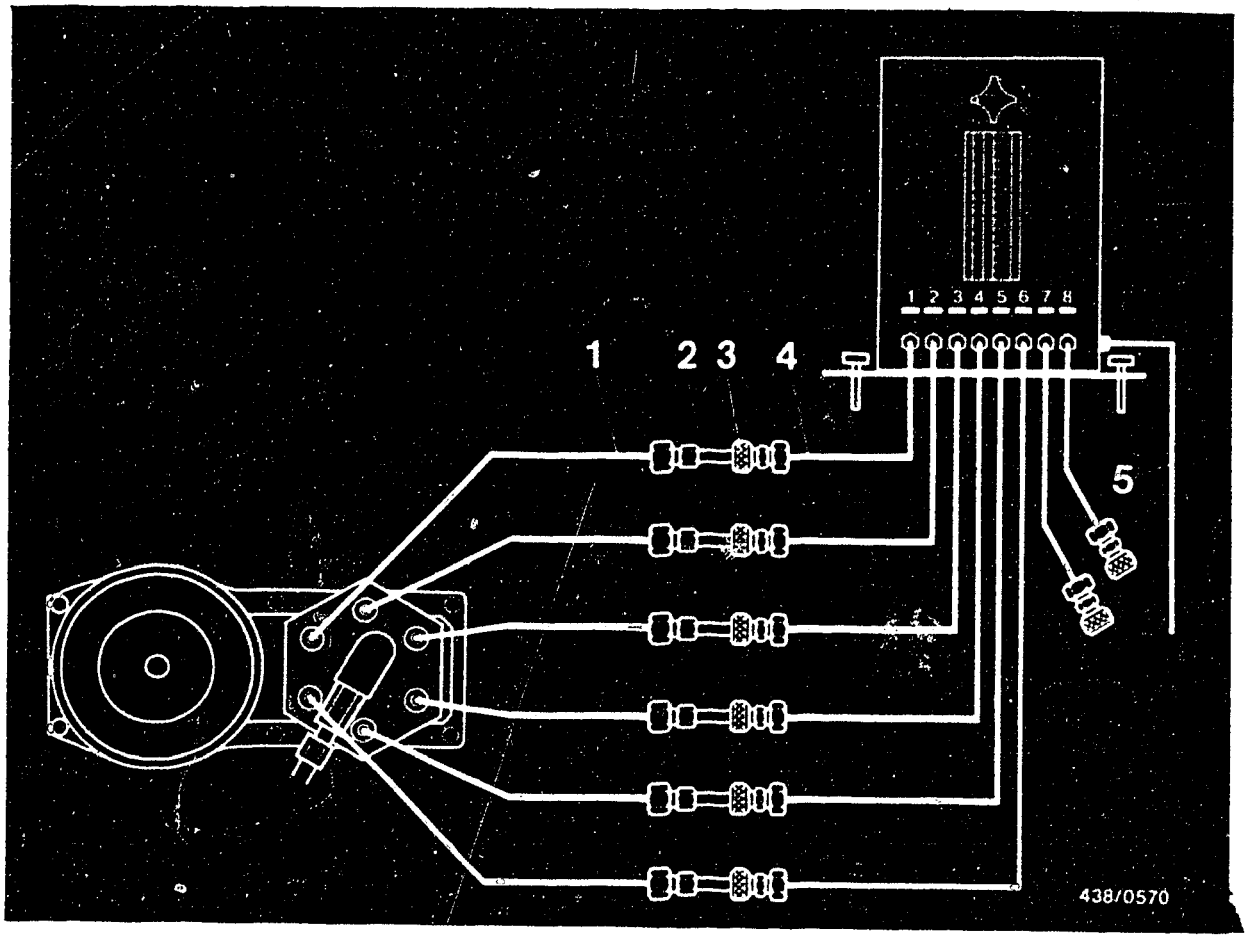
Note the following information when removing and installing:
On the 1978-1980 model (polyamide lines) the injection valves are removed with the fuel-injection lines connected.
On the 1981 model (steel lines) the fuel-injection lines must be unscrewed before removing.
Remove the injection valves from the holding sleeves (in the intake-tube flange), and, using a small screwdriver, lift out any rubber cup seals remaining in the holding sleeves. Do not damage the holding sleeves when doing this (plastic).



Installation: Check the rubber cup seals for damage. Replace if necessary. Wet the rubber cup seals with engine oil and fit.

Force the injection valves as far as they will go into the holding sleeves. The rubber cup seal must be below the bead in the holding sleeves.

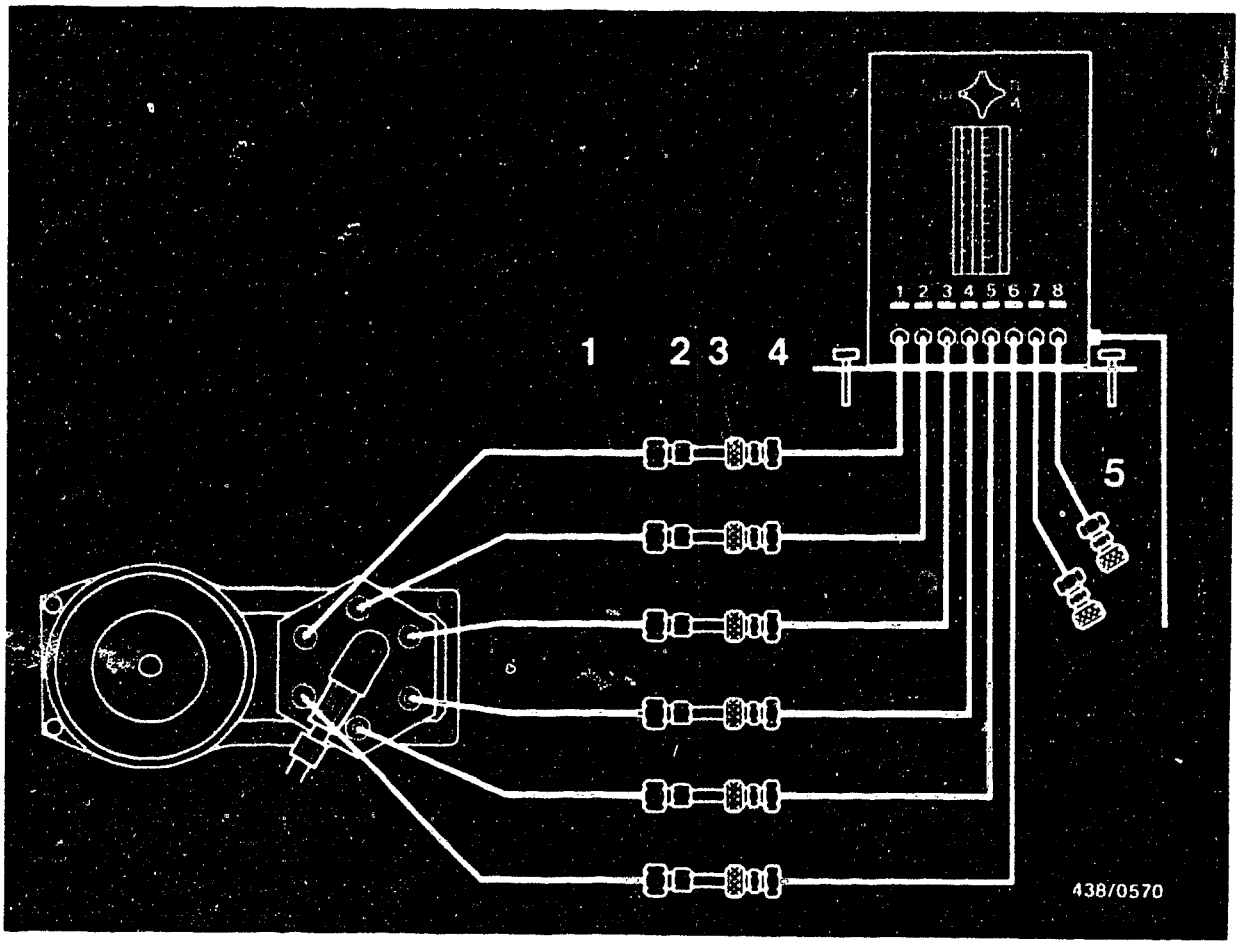
Re-connect the fuel-injection lines, applying counter-force at the fixed hexagonal section of the injection valves.



Connection on the 1978 - 1980 model

Remove the injection valves; the fuel-injection lines remain connected.
Clean the injection valves with a cloth and plug in the correct order into the automatic connectors of the first six tester hoses.

Note:
Plug in the injection valves firmly as far as they will go and tighten the knurled nuts securely so that the non-return valves of the automatic connectors are completely open. Introduce the return hose of the tester into the fuel tank filler neck.



Connection on the 1981 model:

So that the rigid fuel-injection lines are not bent too much, connect the tester for delivered quantity comparison using the adapter lines KDJE-P 200/25.

Remove the injection valves completely.

Unscrew the fuel-injection lines on the fuel distributor and connect instead six adapter lines using the double-threaded fittings M 10x1/M 8x1.

Connect the injection valves to the adapter lines.

Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.

18.4 Bleeding the tester:

Remove the rubber hood from the air-flow sensor.

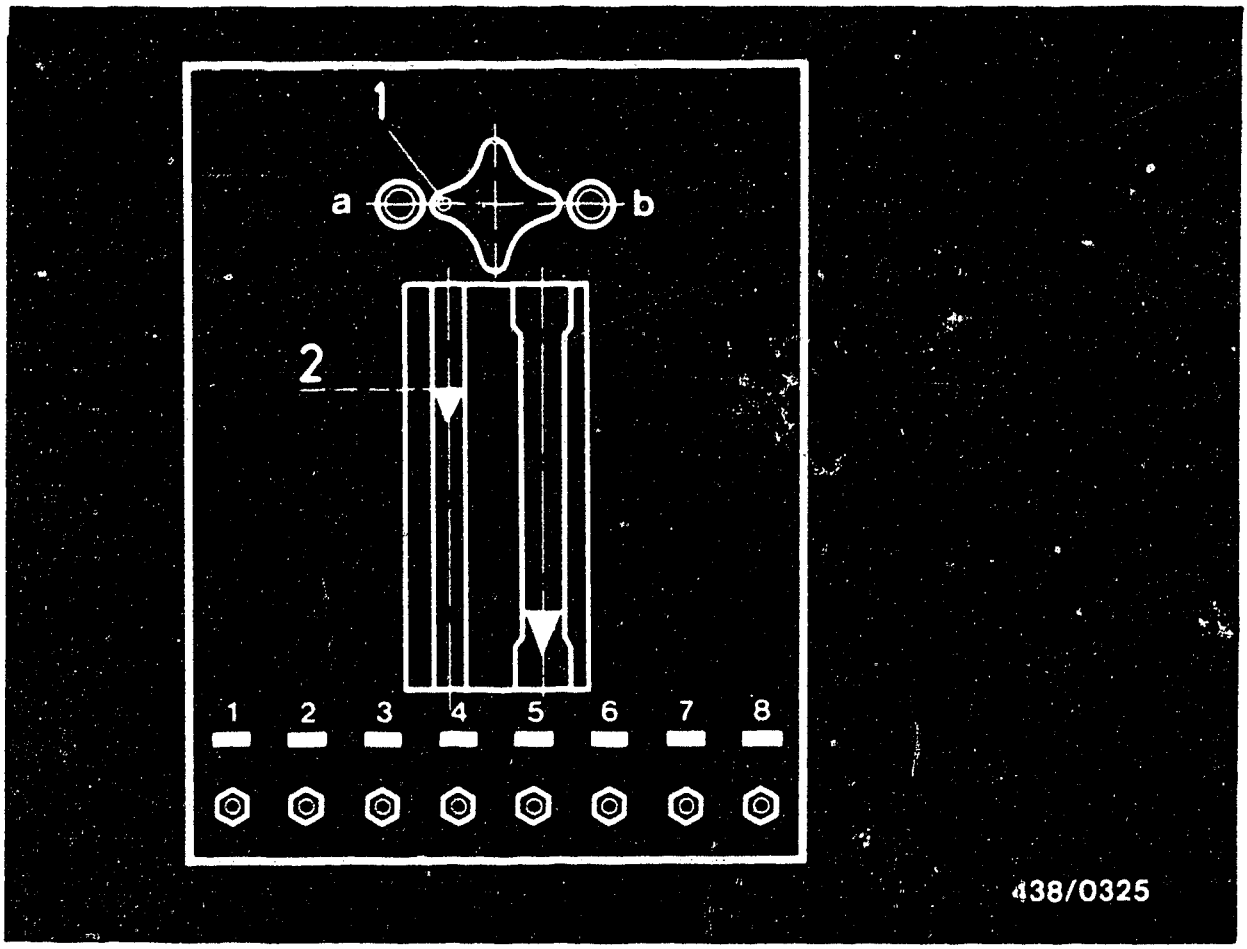
Remove the electric plug from the warm-up regulator and the auxiliary-air device.

Switch on the electric fuel pump by bridging the electrical safety circuit.

Raise the air-flow sensor plate to the stop.

Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.

Return the sensor plate to the rest position.



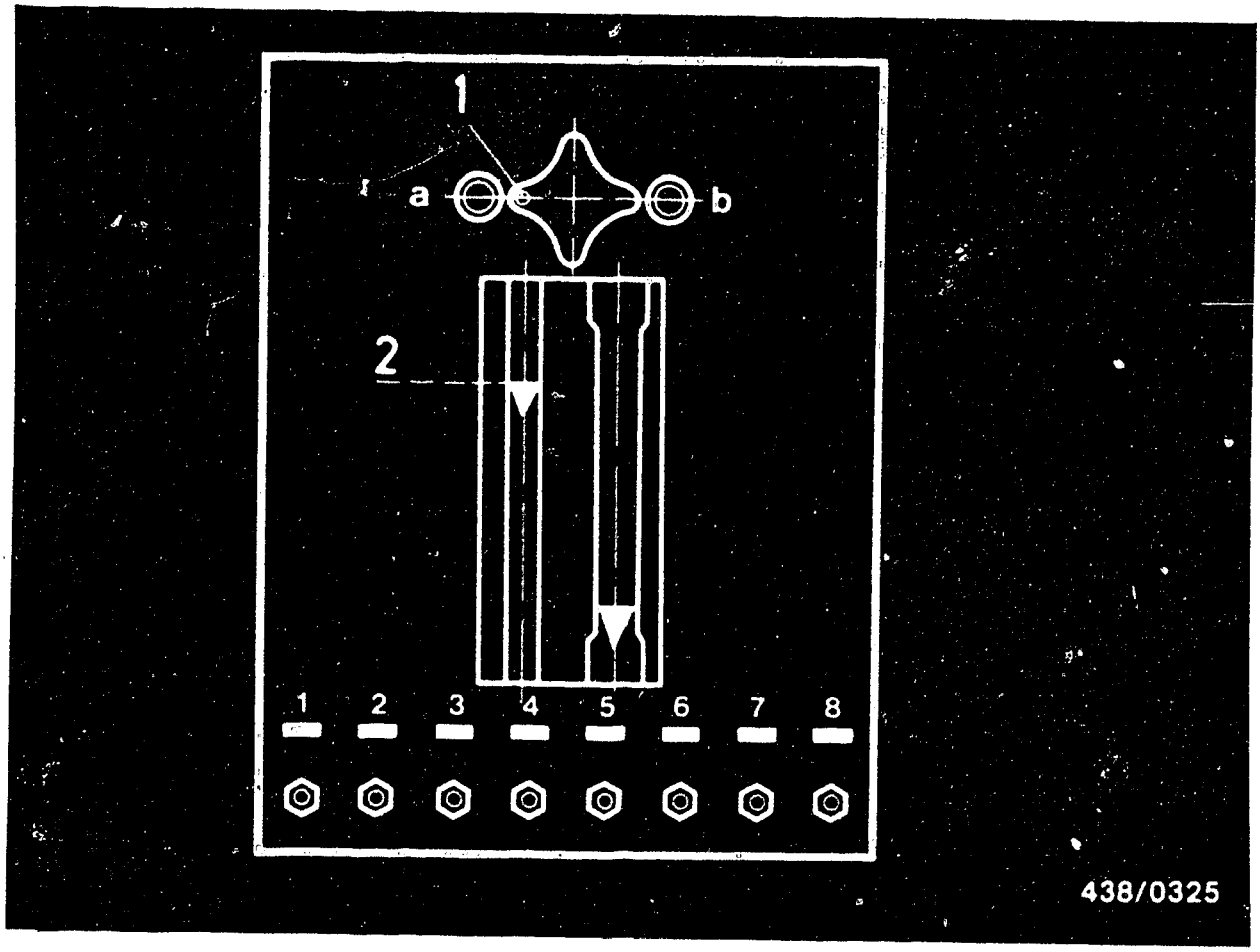
1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

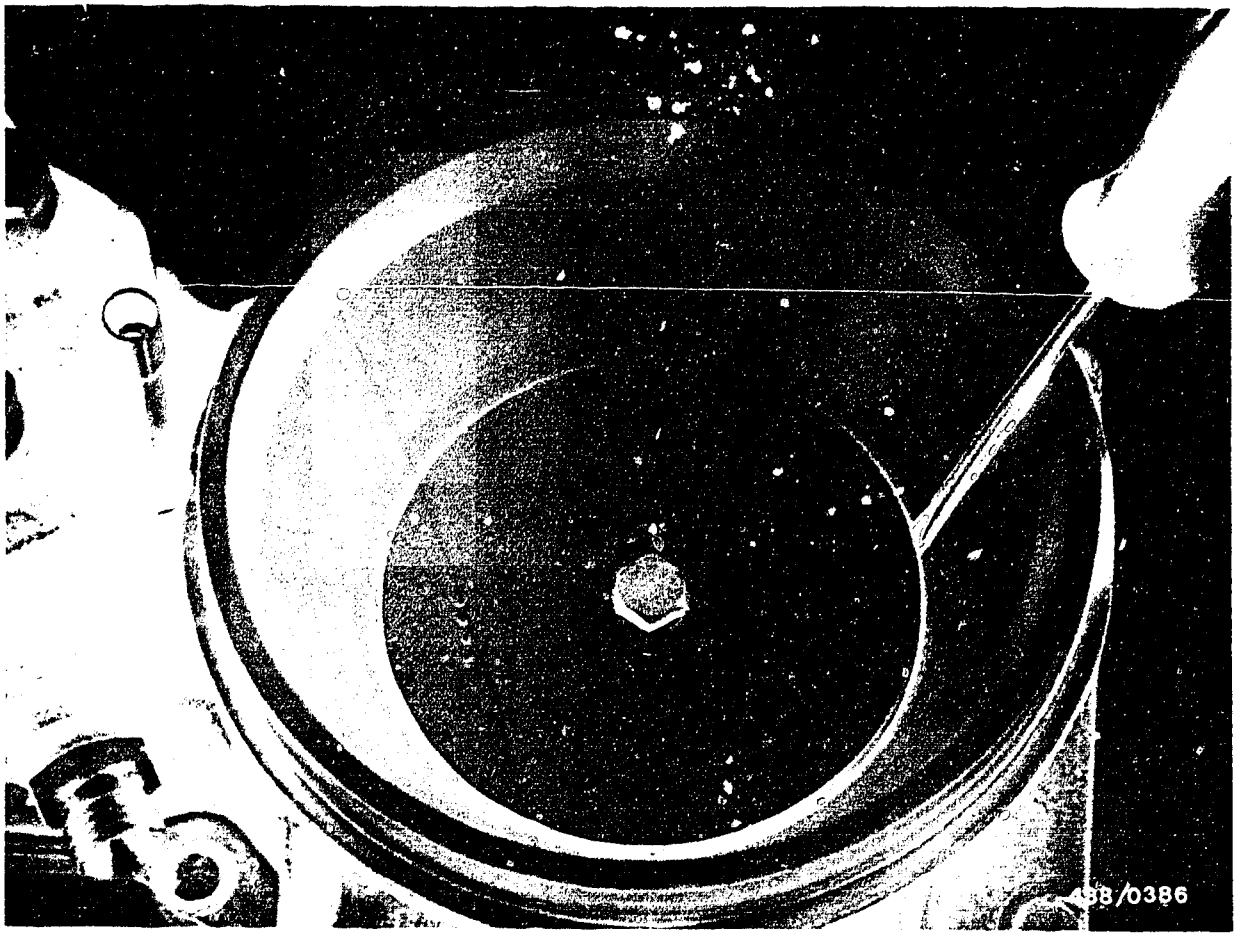
18.5 Testing:

The flow comparison measurement is made in the idle, part-load and full-load ranges.

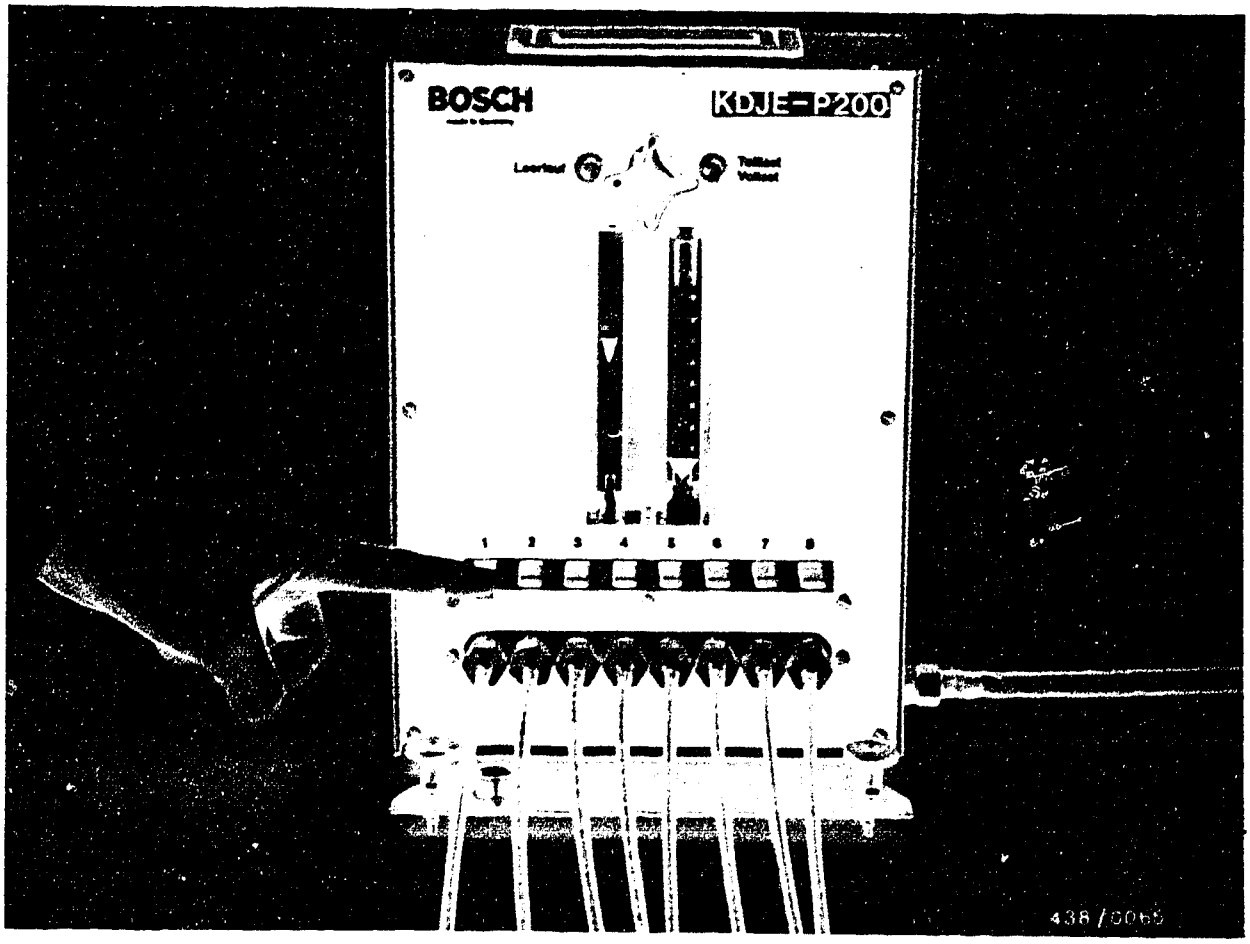
The small rotameter tube is to be used for the idle measurement (white dot to left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to right).



The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2).
On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle-position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.



Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "set point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.
Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

	Set point (cm^3/min)	Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.8
Part load	40.0	44.0
Full load	140.0	153.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

18.7 Final operations

Re-fit the injection valves properly. Also fit the air filter. Make sure that all lines are laid correctly.

Re-connect the electrical safety circuit of the K-Jetronic properly.

Use a trial run to check that there are no leaks in line connections.

Finally check the idle-speed adjustment; if necessary, correct (Coordinates F 20).

19. Idle-speed adjustment

19.1 Test conditions:

Warm the engine for adjusting the idle speed (oil temperature approx. 80°C).

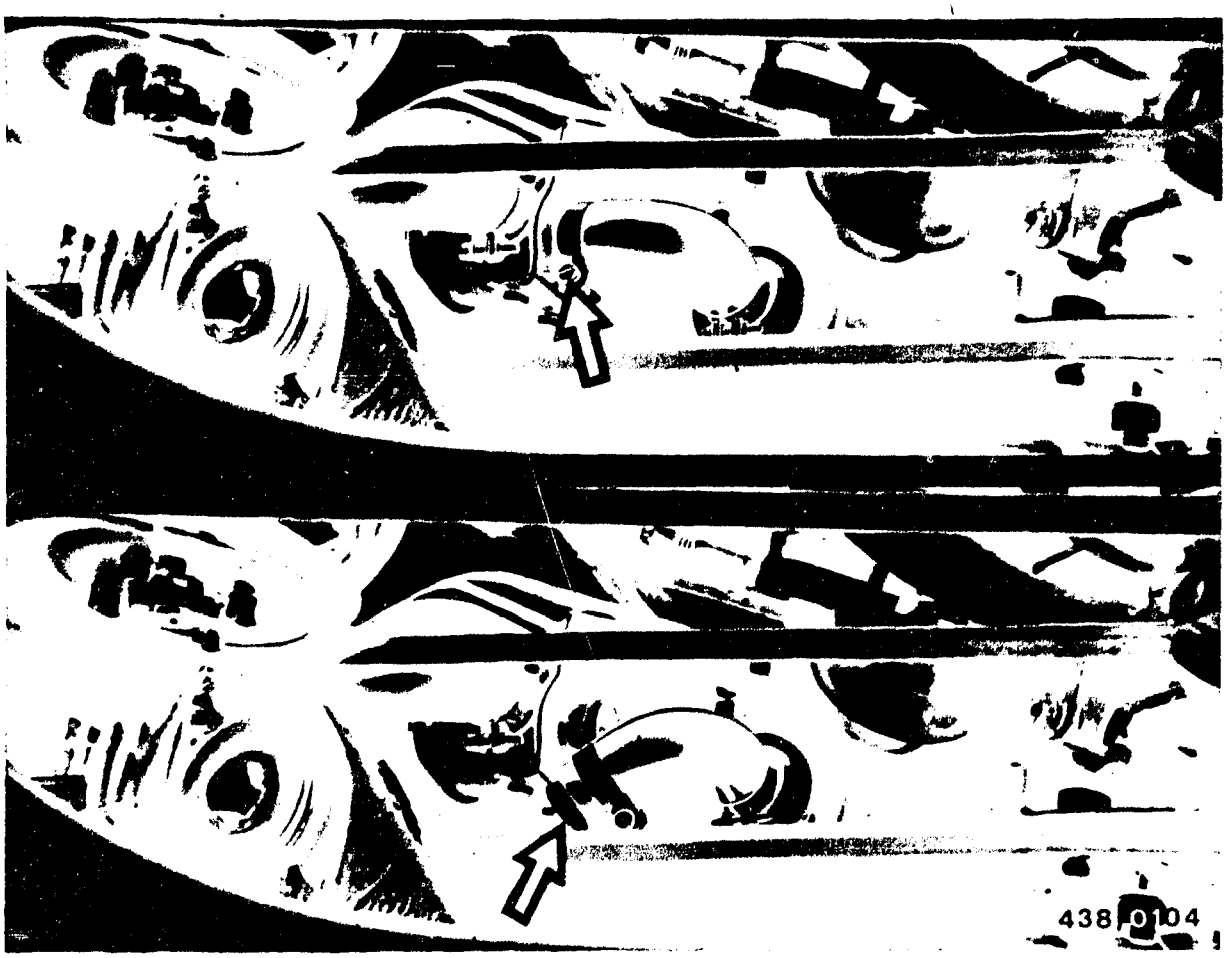
Important note:

If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.

The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.

In vehicles with an air-conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.

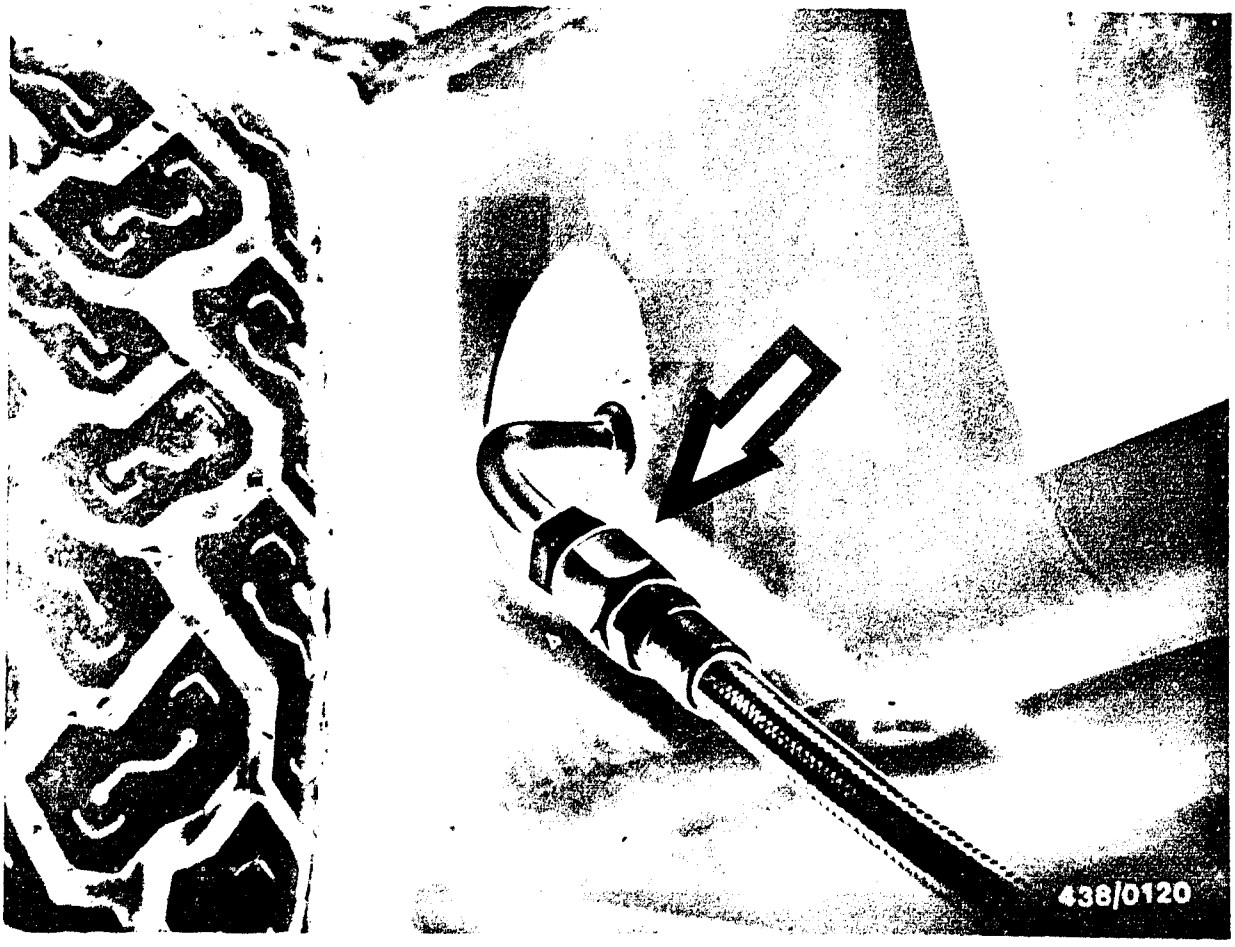
Rotational-speed measurement with separate tester.



Preparations for testing: Before testing and adjusting, render the secondary-air pump inoperative:

Disconnect the air hose from the blow-off valve to the non-return valve at the blow-off valve (upper picture) and seal off tight using a suitable plug (lower picture).

In addition, it must be ensured that the oil tank lid and the seal are correctly seated. Leaks at the oil tank lid lead to unmetered air and thus to incorrect measurements.



In vehicles without an exhaust-gas catalyst the exhaust gas for the CO measurement is taken from the exhaust tail pipe.

In vehicles with an exhaust-gas catalyst the exhaust-gas sampling hose should be connected to the screw connector on the inlet side of the catalyst (arrow).

The specially provided sampling hole is sealed by a cap nut. Remove the cap nut and connect the exhaust-gas hose of the exhaust-gas analyzer using a screw connector M 14x1.5.

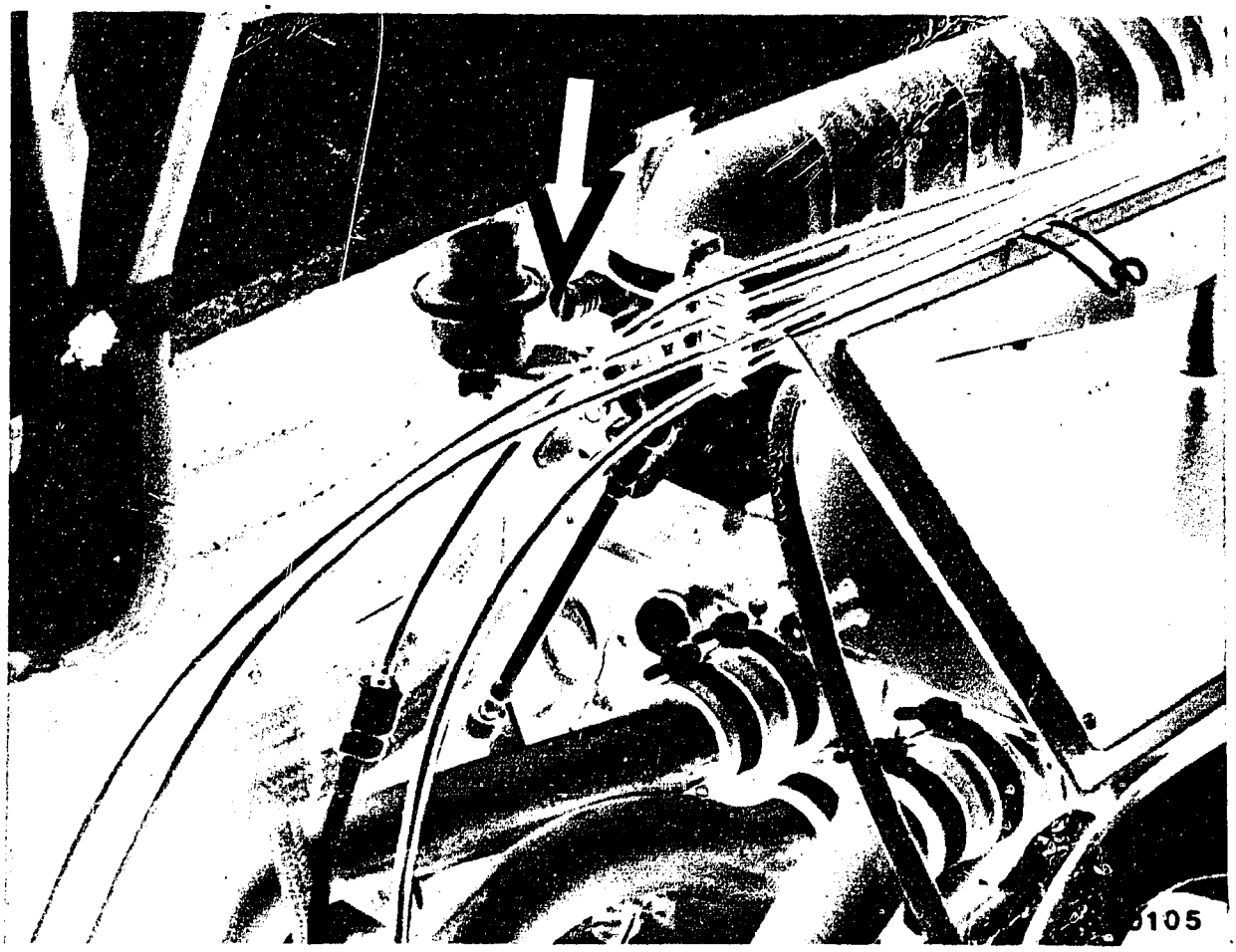
19.2 Test specifications for idle-speed and CO adjustment:

Idle speed:

Model 1978/1979 worldwide version	850...950 min^{-1}
Model 1978/1979 USA/Canada/Japan	900...1000 min^{-1}
Model 1980/1981 worldwide version excluding USA/Canada/Japan (without lambda closed-loop control)	850...950 min^{-1}

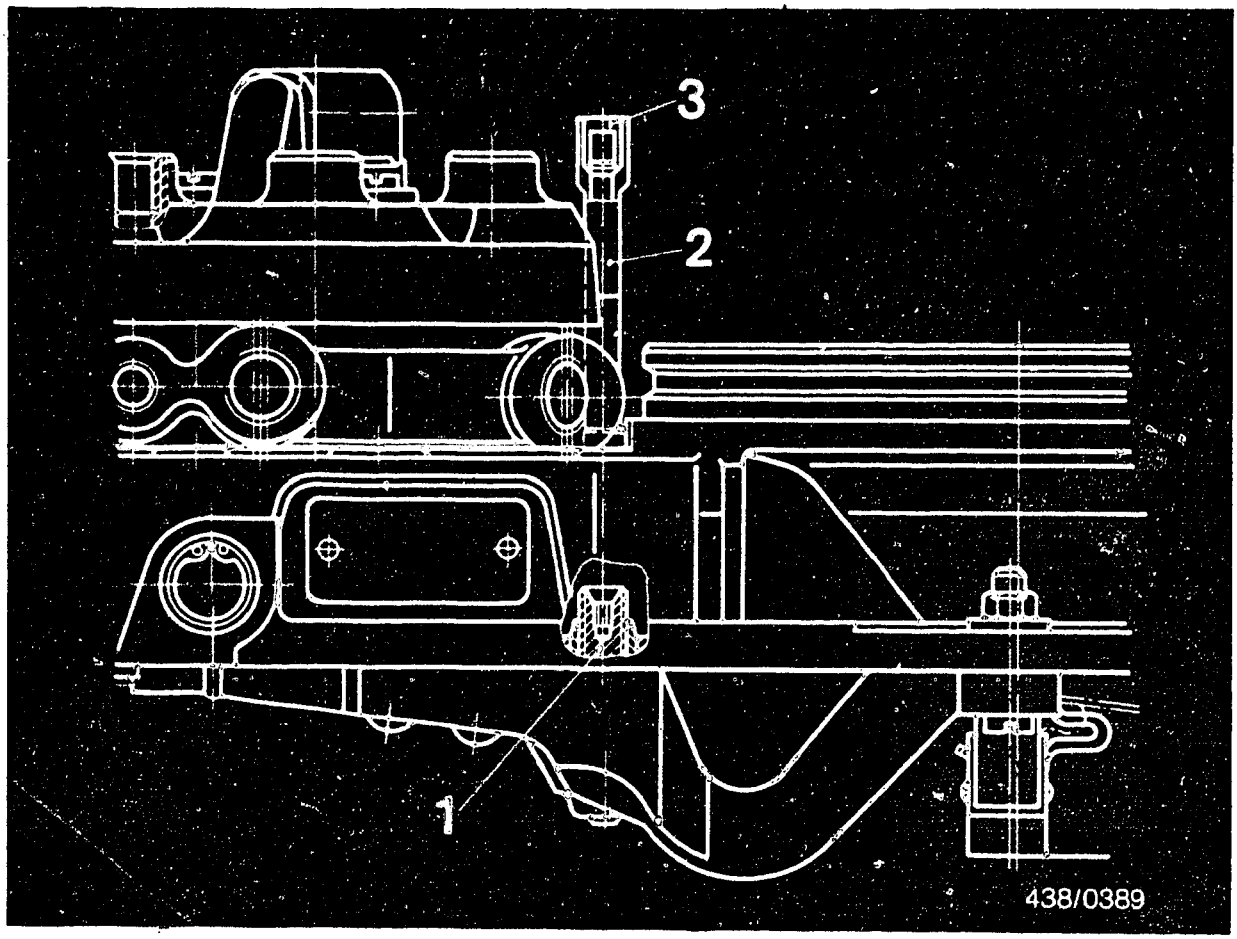
CO concentration:

Model 1978/1979 worldwide version	2.0...4.0 %	without auxiliary-air injection
Model 1978/1979 USA/Canada/Japan (measured upstream of catalyst)	1.5...3.5 %	without auxiliary-air injection
Model 1980/1981 worldwide version excluding USA/Canada/Japan (without lambda closed-loop control)	1.0...2.0 %	without auxiliary-air injection



19.3 Adjustment:

Adjust the idle speed at the bypass screw in the throttle-valve assembly (arrow).



The CO concentration is adjusted by turning the idle-mixture-adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap (3) of the guide tube (2), the adjusting wrench is passed through the guide tube and inserted into the idle-mixture-adjusting screw.

Turning to the right = richer mixture
Turning to the left = leaner mixture

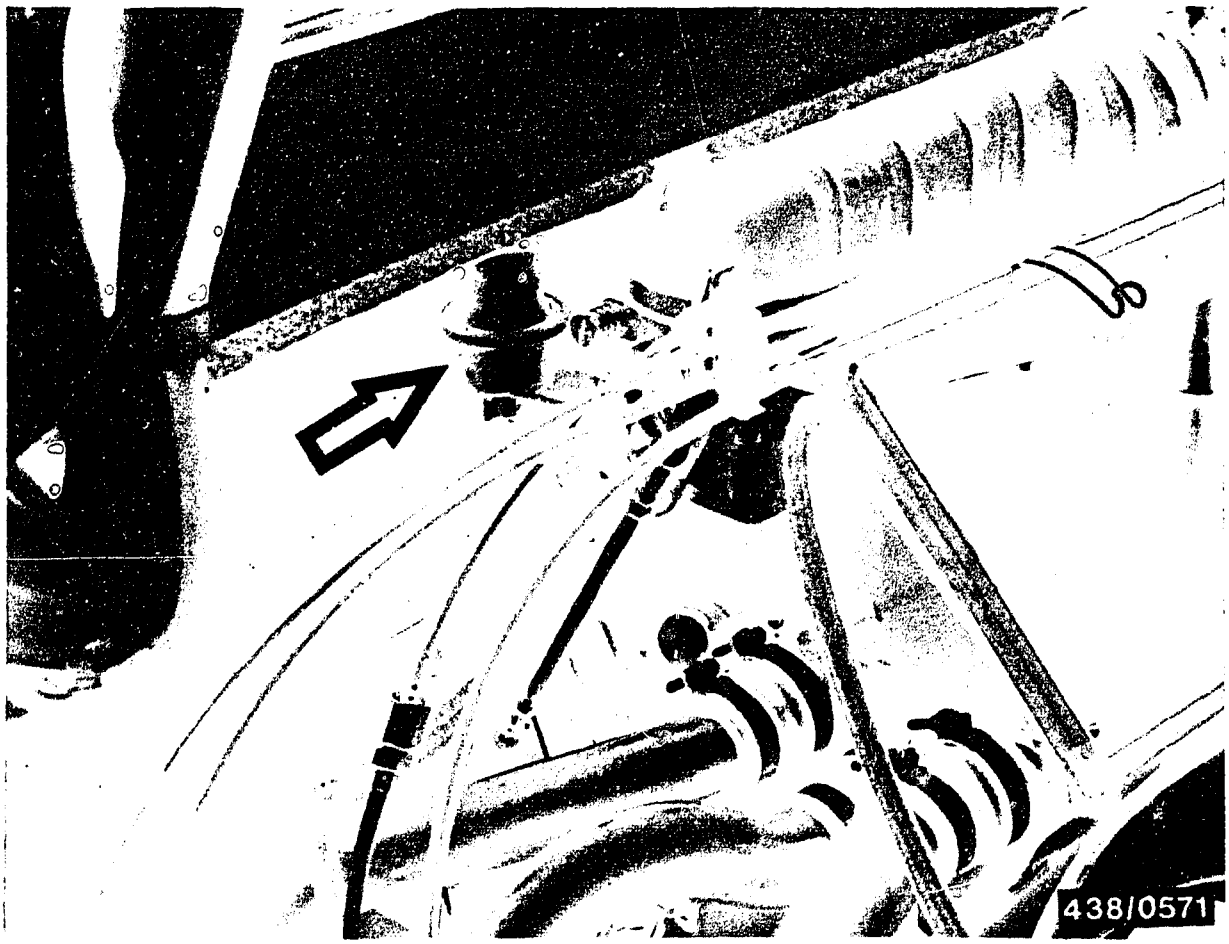
Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle-setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.
These anti-tamper caps come in different colors. The cap to be used for the after-sales service is red.
It can be obtained from Bosch under part number 3 430 522 002.



19.4 Vacuum limiter:

The vacuum limiter (arrow) is a vacuum-controlled auxiliary-air device which opens only on the overrun. In all other operating conditions the vacuum limiter must be sealed tight.
It can be checked as follows:
Measure the idle speed with the vacuum limiter closed (engine at normal operating temperature). Then switch off the engine.

Remove the hose connection before the throttle valve on the throttle-valve assembly and seal off tightly hose and tailpiece. Start the engine again and measure the idle speed. It must not differ from the previous measurement. If the speed has dropped, the vacuum limiter has a leak.

If it is leaking badly, the idle speed is too high and can no longer be adjusted.
Replace the vacuum limiter if leaking.
If the vacuum limiter has had to be replaced, subsequently check or repeat the idle adjustment (Coordinates F 20).

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor

Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor

Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Replaceable non-return valves

Part Number	Appropriate seal ring	Fitted in supply pumps
1 583 385 004	1 580 203 002	0 580 254 990, ..991,..998
.. 006	.. 002	.. 985
1 583 386 008	.. 001	.. 987, ..988,..989
.. 011	.. 001	.. 986, ..996
.. 014	.. 001	.. 992
.. 016	1 580 105 001	.. 970, ..971,..972, .. 973, ..974,..980

Parts sets (comprising non-return valve complete with seal ring)

1 587 010 001	-	0 580 254 992
1 587 410 901	-	.. 978, ..982 FD823→

Supply pumps fitted with non-replaceable non-return valves

0 580 254 975, ..976, ..977, ..979 and ..982 → FD 822

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After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

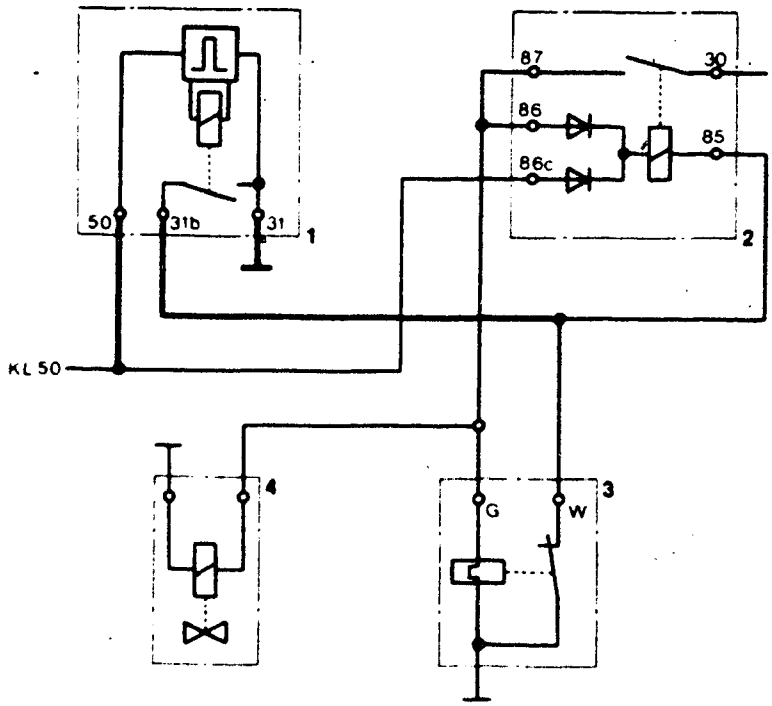
Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

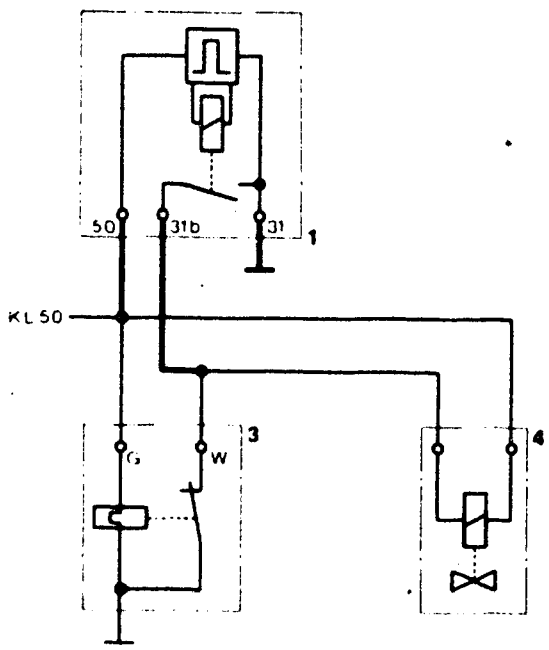
Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung.



K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

FIRMLY FITTED NON-RETURN VALVE

Repairs
fuel pumps 0 580 254 ...

VDT-I-438/107 En
5.1980

Previously fuel pumps with non-exchangeable non-return valve (see VDT-I-438/104 En) had to be exchanged completely in cases of leakage in the non-return valve.

If the fuel pump is in working order and only the non-return valve leaks, there is now the possibility of repairs as part of after-sales service. 2 parts sets have been produced for this purpose, they contain, amongst other things, a tube fitting with built-in non-return valve.

Before using the parts set the installation conditions should be checked. The defective non-return valve can remain in the fuel pump which does not have to be dismantled for fitting the parts set. Before disconnecting the fuel lines the pressure fittings of the fuel pump and the fuel lines should be thoroughly cleaned.

Description and fitting

Parts set 1 587 010 003 for fuel connection with inlet union.

Screw the tube fitting (short side) with the thick flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Place the thin flat seal ring, the fuel-line inlet union and the other flat seal ring on to the long side of the tube fitting and tighten with the hexagon cap nut. Run the engine and check that there are no leaks in the connection.

Parts set 1 587 010 004 for fuel connection with nipple and union nut.

Screw the tube fitting with flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Screw the fuel line to the tube fitting with a union nut and tighten. Run the engine and check that there are no leaks in the connection.

BOSCH
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